Appendix A: Contributors, Authors, and Acknowledgements

A.1 Contributors/REIS Study Project Team

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DISCLAIMER

While we are grateful for the technical and critical support of those acknowledged below, responsibility for the conclusions and recommendations contained herein rests with the authoring organizations and the **REIS STUDY PROJECT TEAM**.

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Appendix B: List of Acronyms Used in This Study

AEO	Annual Energy Outlook
AGC	Automatic generation control
APCD	Air Pollution Control District
BACT	Best available control technology
BCAP	Biennial Cost Allocation Procedure
B/C	Benefit-cost ratio
Btu	British thermal unit
C&I	Commercial and industrial end users
CC	Combined cycle
CAISO	California Independent System Operator
CDWR	California Department of Water Resources
CEC	California Energy Commission
CERA	Cambridge Energy Resource Associates
CEQA	California Environmental Quality Act
CPA	California Power Authority
CFE	Commission Federal de Electricidad
CITY	City of San Diego
CO2	Carbon Dioxide
COUNTY	County of San Diego
CPUC	California Public Utilities Commission
CHP	Combined heat and power (cogeneration)
CH4	Methane
CT	Combustion turbine
CWA	County Water Authority
DC	Direct current
DER	Distributed energy resources
DG	Distributed generation
DHW	Domestic Hot Water (Solar)
DOE	United States Department of Energy
DR	Distributed resources
DSM	Demand Side Management
DVU	Discovery Valley Utility
E2PRO	Energy Environment Program
EER	Energy Efficiency Ratio
EG	Electric Generation

EIA	Energy Information Agency
EPA	Environmental Protection Agency
ERC	Emission Reduction Credits
ESCO	Energy service company
ESP	Electric service provider
FERC	Federal Energy Regulatory Commission
FSEC	Florida Solar Energy Center
GIR	Gas Industry Restructuring
GRP	Gross regional product
HRSG	Heat Recovery Steam Generator
HVAC	Heating ventilation and air conditioning
ICIP	Incremental Cost Incentive Pricing
IOU	Investor owned utility
IPP	Independent power producer
IRR	Internal Rate of Return
IRP	Integrated Resource Planning
ISO	Independent systems operator
JPA	Joint Power Authority
kV	Kilovolt
kW	Kilowatt
kWh	Kilowatt Hour
LADWP	Los Angeles Department of Water and Power
LNG	Liquefied Natural Gas
LRMC	Long-run market costs
LRMV	Long run market value
LSE	Load Supplying Entities
MCF	One thousand cubic feet of natural gas
MD02	CAISO's Market Design 2002
NERC	National Energy Reliability Council
NOx	Oxides of Nitrogen
NPV	Net Present Value
NRC	Nuclear Regulatory Commission
MMBtu	One million Btu
MSEC	Mobile source emission credits
MSW	Municipal Solid Waste
MW	Megawatt
MWh	Megawatt Hour

O&M	Operation and maintenance
PBR	Performance based ratemaking
PM	Particulate matter
PM-10	Particulate matter under ten microns
Port	Port of San Diego
PPM	Parts per million
PURPA	The Public Utility Regulatory Policy Act of 1978
PV	Photovoltaic(s)
QF	Qualifying facility
RDA	Resources Data International
REPAC	Regional Energy Policy Advisory Council
RES	Regional Energy Strategy
RMR	Reliability must-run
ROG	Reactive Organic Gasses
RTO	Regional Transmission Organization
RTP	Real-time Pricing
SAIC	Science Application International Corporation
SANDAG	San Diego Association of Governments
SDREO	San Diego Regional Energy Office
SDG&E	San Diego Gas and Electric
SEER	Seasonal energy efficiency ratio
SMUD	Sacramento Municipal Utility District
SO_x	Oxides of sulfur
SWRTA	Southwest Regional Transmission Association
T&D	Transmission and Distribution
TOU	Time-of-use
UCAN	Utility Consumers Action Network
UDC	Utility distribution company
VAV System	Variable air volume system
VOC	Volatile Organic Compounds
WECC	Western Electricity Coordinating Council
WRTA	Western Regional Transmission Association
WSCC	Western System Coordinating Council

Appendix C: Glossary of Terms Used in This Study

AGGREGATOR – An entity responsible for planning, scheduling, accounting, billing, and settlement for energy deliveries from the aggregator's portfolio of sellers and/or buyers. Aggregators seek to bring together customers or generators so they can buy or sell power in bulk, making a profit on the transaction.

AIR POLLUTION – Unwanted particles, mist or gases put into the atmosphere as a result of motor vehicle exhaust, the operation of industrial facilities or other human activity.

ANCILLARY SERVICES – The services other than scheduled energy that is required to maintain system reliability and meet WSCC/NERC operating criteria. Such services include spinning, non-spinning, and replacement reserves, voltage control, and black start capability. Services that the Independent System Operator may develop, in cooperation with market participants, to ensure reliability and to support the transmission of energy from generation sites to customer loads. Such services may include: regulation, spinning reserve, non-spinning reserve, replacement reserve, voltage support, and black start.

APPLIANCE EFFICIENCY STANDARDS – California Code of Regulations, Title 20, Chapter 2, Subchapter 4: Energy Conservation, Article 4: Appliance Efficiency Standards. Appliance Efficiency Standards regulate the minimum performance requirements for appliances sold in California and apply to refrigerators, freezers, room air conditioners, central air conditioners, gas space heaters, water heaters, plumbing fittings, fluorescent lamp ballasts and luminaries, and ignition devices for gas cooking appliances and gas pool heaters. New National Appliance Standards are in place for some of these appliances and will become effective for others at a future date.

AVOIDED COST – The cost the utility would incur but for the existence of an independent generator or other energy service option. Avoided cost rates have been used as the power purchase price utilities offer independent suppliers.

BALLAST – A device that provides starting voltage and limits the current during normal operation in electrical discharge lamps (such as fluorescent lamps).

BASE LOAD – The lowest level of power production needs during a season or year.

BASE LOAD UNIT – A power generating facility that is intended to run constantly at near capacity levels, as much of the time as possible.

BASELINE FORECAST – A prediction of future energy needs which does not take into account the likely effects of new conservation programs that have not yet been started.

B/C– Benefit-cost ratio/Cost effectiveness – measured in terms of:

- Participant Test – NPV bill savings divided by the NPV cost to participate in DSM
- Utility Test – NPV of fuel and capacity savings to the utility divided by dollars invested in DSM including equipment and program
- Societal Test – Total Energy and Capacity savings divided by program costs.

BIOMASS – Energy resources derived from organic matter. These include wood, agricultural waste and other living-cell material that can be burned to produce heat energy.

BRITISH THERMAL UNITS — Measure of energy.

BROKER — an entity arranging the sale and purchase of electric energy, transmission, and other services between buyers and sellers, but does not take title to any of the power sold (Public Resources Code section 331(b)).

BUILDING ENERGY EFFICIENCY STANDARDS – California Code of Regulations (California Code of Regulations), Title 24, Part 2, Chapter 2-53; regulating the energy efficiency of buildings constructed in California.

BUILDING ENVELOPE – The assembly of exterior partitions of a building, which enclose conditioned spaces, through which thermal energy may be transferred to or from the exterior, unconditioned spaces, or the ground. [See California Code of Regulations, Title 24, Section 2-5302]

CALIFORNIA ENERGY COMMISSION – The state agency established by the Warren-Alquist State Energy Resources Conservation and Development Act in 1974 (Public Resources Code, Sections 25000 et seq.) responsible for energy policy. The Energy Commission's five major areas of responsibilities are:

- Forecasting future statewide energy needs
- Licensing power plants sufficient to meet those needs
- Promoting energy conservation and efficiency measures
- Developing renewable and alternative energy resources, including providing assistance to develop clean transportation fuels
- Planning for and directing state response to energy emergencies
- Funding for the Commission's activities comes from the Energy Resources Program Account, Federal Petroleum Violation Escrow Account and other sources.

CAPACITY – The maximum load a generating unit, generating station, or other electrical apparatus is rated to carry by the user or the manufacturer or can actually carry under existing service conditions.

CAPACITY RELEASE/MARKET – A secondary market for capacity that is contracted by a customer, which is not using all of its capacity.

CALIFORNIA DEPARTMENT OF WATER RESOURCES – (CDWR) Primary responsibility is water resource development and management. Also buys electricity for investor-owned utilities in wholesale market and resells power to investor owned utilities in form of long term contracts. These contracts have recently been renegotiated by CDWR. This is viewed as a temporary solution.

CALIFORNIA INDEPENDENT SYSTEM OPERATOR (CAISO) – Scheduler, balancing and settlement of wholesale power transaction for California utilities making wholesale power transactions

CALIFORNIA POWER AUTHORITY – Focus is on developing peak reserve margin and in developing renewable energy and conservation projects. Success depends on ability to issue bonds and have them purchased.

CALIFORNIA PUBLIC UTILITIES COMMISSION (CPUC) – A state agency created by constitutional amendment in 1911 to regulate the rates and services of more than 1,500 privately owned utilities and 20,000 transportation companies. The major duties of the CPUC are to regulate privately owned utilities, securing adequate service to the public at rates that are just and reasonable both to customers and shareholders of the utilities; including rates, electricity transmission lines and natural gas pipelines. The CPUC also provides electricity and natural gas forecasting, and analysis and planning of energy supply and resources. Its main headquarters are in San Francisco.

CAPACITY (Electric utility) – The maximum amount of electricity that a generating unit, power plant or utility can produce under specified conditions. Capacity is measured in megawatts and is also referred to as the NAMEPLATE RATING.

CARBON DIOXIDE – A colorless, odorless, non-poisonous gas that is a normal part of the air. Carbon dioxide, also called CO2, is exhaled by humans and animals and is absorbed by green growing things and by the sea.

CHILLER – A device that cools water, usually to between 40 and 50 degrees Fahrenheit for eventual use in cooling air.

CHP – Combined Heat and Power.

CIRCUIT – One complete run of a set of electric conductors from a power source to various electrical devices (appliances, lights, etc.) and back to the same power source.

CLIMATE ZONE – A geographical area is the state that has particular weather patterns. These zones are used to determine the type of building standards that are required by law.

COGENERATOR – Co generators use the waste heat created by one process, for example during manufacturing, to produce steam, which is used, in turn, to spin a turbine and generate electricity. Co generators may also be QFs.

COGENERATION – Cogeneration means the sequential use of energy for the production of electrical and useful thermal energy. The sequence can be thermal use followed by power production or the reverse, subject to the following standards:

- At least 5 percent of the cogeneration project's total annual energy output shall be in the form of useful thermal energy.
- Where useful thermal energy follows power production, the useful annual power output plus one-half the useful annual thermal energy output equals not less than 42.5 percent of any natural gas and oil energy input.

COMBINED CYCLE PLANT – An electric generating station that uses waste heat from its gas turbines to produce steam for conventional steam turbines.

CONSERVATION – Steps taken to cause less energy to be used than would otherwise be the case. These steps may involve improved efficiency, avoidance of waste, reduced consumption, etc. They may involve installing equipment (such as a computer to ensure efficient energy use), modifying equipment (such as making a boiler more efficient), adding insulation, changing behavior patterns, etc.

CONTROL AREA – An electric power system, or a combination of electric power systems, to which a common automatic generation control (AGC) is applied to match the power output of generating units within the area to demand. The control area of the ISO is the state of California.

COOLING DEGREE DAY – A unit of measure that indicates how heavy the air-conditioning needs are under certain weather conditions.

COOLING LOAD – The rate at which heat must be extracted from a space in order to maintain the desired temperature within the space.

CUBIC FOOT – The most common unit of measurement of natural gas volume. It equals the amount of gas required to fill a volume of one cubic foot under stated conditions of temperature, pressure and water vapor. One cubic foot of natural gas has an energy content of approximately 1,000 Btus. One hundred (100) cubic feet equals one therm (100 ft^3 = 1 therm).

DAY-AHEAD MARKET – The forward market for energy and ancillary services to be supplied during the settlement period of a particular trading day that is conducted by the ISO, the PX, and other Scheduling Coordinators. This market closes with the ISO's acceptance of the final day-ahead schedule.

DAYLIGHTING – The use of sunlight to supplement or replace electric lighting.

DAYLIGHTING CONTROL – A control system that varies the light output of an electric lighting system in response to variations in available daylight.

DEGREE DAY – A unit, based upon temperature difference and time, used in estimating fuel consumption and specifying nominal annual heating load of a building. When the mean temperature is

less than 65 degrees Fahrenheit the heating degree-days are equal to the total number of hours that temperature is less than 65 degrees Fahrenheit for an entire year.

DEMAND RESPONSE PROGRAM – A demand reduction program where for economic or low reserve reasons a customer reduces their peak load for incentive compensation which may be either on an intermittent day head basis or for a longer term.

DEMAND SIDE MANAGEMENT (DSM) – Planning, implementation, and evaluation of utility-sponsored programs to influence the amount or timing of customers' energy use.

DEMAND (Utility) the level at which electricity or natural gas is delivered to users at a given point in time. Electric demand is expressed in kilowatts.

DEMAND BILLING – The electric capacity requirement for which a large user pays. It may be based on the customer's peak demand during the contract year, on a previous maximum or on an agreed minimum. Measured in kilowatts.

DEMAND CHARGES – The sum to be paid by a large electricity consumer for its peak usage level.

DEPARTMENT OF ENERGY (DOE) – The federal department established by the Department of Energy Organization Act to consolidate the major federal energy functions into one cabinet-level department that would formulate a comprehensive, balanced national energy policy. DOE's main headquarters are in Washington, D.C.

DERIVATIVES – A specialized security or contract that has no intrinsic overall value, but whose value is based on an underlying security or factor as an index. A generic term that, in the energy field, may include options, futures, forwards, etc.

DIRECT CURRENT (DC) – Electricity that flows continuously in the same direction.

DISTRIBUTION – The delivery of electricity to the retail customer's home or business through low voltage distribution lines.

DISTRIBUTED GENERATION – A distributed generation system involves small amounts of generation located on a utility's distribution system for the purpose of meeting local (substation level) peak loads and/or displacing the need to build additional (or upgrade) local distribution lines.

DISTRIBUTION SYSTEM (Electric utility) – The substations, transformers and lines that convey electricity from high-power transmission lines to ultimate consumers.

DISTRIBUTION UTILITY – The regulated electric utility entity that constructs and maintains the distribution wires connecting the transmission grid to the final customer. The Disco can also perform other services such as aggregating customers, purchasing power supply and transmission services for customers, billing customers and reimbursing suppliers, and offering other regulated or non-regulated energy services to retail customers. The "wires" and "customer service" functions provided by a distribution utility could be split so that two totally separate entities are used to supply these two types of distribution services.

Distributed Resources (DR) – Includes energy efficiency, load management, renewables and distributed generation.

ECONOMIC EFFICIENCY – A term that refers to the optimal production and consumption of goods and services. This generally occurs when prices of products and services reflect their marginal costs. Economic efficiency gains can be achieved through cost reduction, but it is better to think of the concept as actions that promote an increase in overall net value (which includes, but is not limited to, cost reductions).

ECONOMIZER AIR – A ducting arrangement and automatic control system that allows a heating, ventilation and air conditioning (HVAC) system to supply up to 100-percent outside air to satisfy cooling demands, even if additional mechanical cooling is required.

ENERGY EFFICIENCY – Using less energy/electricity to perform the same function. Programs designed to use electricity more efficiently – doing the same with less. For the purpose of this paper, energy efficiency is distinguished from DSM programs in that the latter are utility-sponsored and -financed, while the former is a broader term not limited to any particular sponsor or funding source. "Energy conservation" is a term which has also been used but it has the connotation of doing without in order to save energy rather than using less energy to do the some thing and so is not used as much today. Many people use these terms interchangeably.

ENVIRONMENTAL PROTECTION AGENCY – A federal agency charged with protecting the environment.

EPA Act – The Energy Policy Act of 1992 addresses a wide variety of energy issues. The legislation creates a new class of power generators, exempt wholesale generators (EWGs), that are exempt from the provisions of the Public Utilities Holding Company Act of 1935 and grants the authority to FERC to order and condition access by eligible parties to the interconnected transmission grid.

ENERGY SERVICES COMPANIES (ESCOs) – ESCOs would be created in a deregulated, openly competitive electric marketplace. The Energy Services industry would be made up of power aggregators, power marketers and brokers, whose job is to match buyers and sellers, tailor both physical and financial instruments to suit the needs of particular customers, and to allow even the smallest residential customers to form buying groups or cooperatives that will give them the same bargaining power as large industrial customers.

ENERGY EFFICIENCY RATIO (EER) – the ratio of cooling capacity of an air conditioning unit in Btus per hour to the total electrical input in watts under specified test conditions. California Code of Regulations, Section 1602(c)(6).

EFFICIENCY – The ratio of the useful energy delivered by a dynamic system (such as a machine, engine, or motor) to the energy supplied to it over the same period or cycle of operation. The ratio is usually determined under specific test conditions.

ELECTRIC GENERATOR – A device that converts a heat, chemical or mechanical energy into electricity.

ELECTRICITY – A property of the basic particles of matter. A form of energy having magnetic, radiant and chemical effects. Electric current is created by a flow of charged particles (electrons).

EMISSION STANDARD – The maximum amount of a pollutant legally permitted to be discharged from a single source.

ENERGY – The capacity for doing work. Forms of energy include: thermal, mechanical, electrical and chemical. Energy may be transformed from one form into another.

EER (Energy Efficiency Ratio) – The ratio of cooling capacity of an air conditioning unit in Btus per hour to the total electrical input in watts under specified test conditions. [See California Code of Regulations, Title 20, Section 1602(c)(6)]

ENERGY INTENSITY – The ratio of Gross Regional Product to energy consumed. A measure of economic energy efficiency.

ENERGY MANAGEMENT SYSTEM – A control system (often computerized) designed to regulate the energy consumption of a building by controlling the operation of energy consuming systems, such as the heating, ventilation and air conditioning (HVAC), lighting and water heating systems.

ENERGY CHARGE – The amount of money owed by an electric customer for kilowatt-hours consumed.

ENERGY CONSUMPTION – The amount of energy consumed in the form in which it is acquired by the user. The term excludes electrical generation and distribution losses.

ESCO – Efficiency Service Company. A company that offers to reduce a client's electricity consumption with the cost savings being split with the client.

FEDERAL ENERGY REGULATORY COMMISSION (FERC) – regulates interstate sales and transportation of electric and natural gas.

FLUORESCENT LAMP – A tubular electric lamp that is coated on its inner surface with a phosphor and that contains mercury vapor whose bombardment by electrons from the cathode provides ultraviolet light which causes the phosphor to emit visible light either of a selected color or closely approximating daylight.

FORCED OUTAGE RATE – the percentage of time a plant is out of operation. This is the single most important determinant of local reliability of power. The higher the outage rate the lower the reliance on a unit when needed.

FORWARD ELECTRIC PRICES – Projected wholesale prices for energy and capacity based on natural gas prices, plant heat rates, transmission access, market demand, and plant dispatch.

FUEL CELL – A device or an electrochemical engine with no moving parts that converts the chemical energy of a fuel, such as hydrogen, and an oxidant, such as oxygen, directly into electricity. The principal components of a fuel cell are catalytically activated electrodes for the fuel (anode) and the oxidant (cathode) and an electrolyte to conduct ions between the two electrodes, thus producing electricity.

FUEL DIVERSITY – A utility or power supplier that has power stations using several different types of fuel. Avoiding over-reliance on one fuel helps avoid the risk of supply interruption and price spikes

GENERATING STATION – A power plant and ancillary equipment including fuel storage

GEOTHERMAL ELEMENT – an element of a county general plan consisting of a statement of geothermal development policies, including a diagram or diagrams and text setting forth objectives, principles, standards, and plan proposals, including a discussion of environmental damages and identification of sensitive environmental areas, including unique wildlife habitat, scenic, residential, and recreational areas, adopted pursuant to Section 65303 of the Government Code.

GEOTHERMAL ENERGY – Natural heat from within the earth, captured for production of electric power, space heating or industrial steam.

GIGAWATT (GW) – One thousand megawatts (1,000 MW) or, one million kilowatts (1,000,000 kW) or one billion watts (1,000,000,000 watts) of electricity. One gigawatt is enough to supply the electric demand of about one million average California homes.

GIGAWATT-HOUR (GWH) – One million kilowatt-hours of electric power. California's electric utilities generated a total of about 270,000 gigawatt-hours in 1988.

GREENHOUSE EFFECT – The presence of trace atmospheric gases make the earth warmer than would direct sunlight alone. These gases (carbon dioxide [CO2], methane [CH4], nitrous oxide [N2O], tropospheric ozone [O3], and water vapor [H2O]) allow visible light and ultraviolet light (shortwave radiation) to pass through the atmosphere and heat the earth's surface. This heat is re-radiated from the earth in form of infrared energy (longwave radiation). The greenhouse gases absorb part of that energy before it escapes into space. This process of trapping the long wave radiation is known as the greenhouse effect. Scientists estimate that without the greenhouse effect, the earth's surface would be roughly 54 degrees Fahrenheit colder than it is today – too cold to support life, as we know it.

GREENHOUSE EFFECT (relating to buildings) – The characteristic tendency of some transparent materials (such as glass) to transmit radiation with relatively short wavelengths (such as sunlight) and block radiation of longer wavelengths (such as heat). This tendency leads to a heat build-up within the space enclosed by such a material.

GRID – A system of interconnected power lines and generators that is managed so that the generators are dispatched as needed to meet the requirements of the customers connected to the grid at various points.

HEAT RATE – A number that tells how efficient a fuel-burning power plant is. The heat rate equals the Btu content of the fuel input divided by the kilowatt-hours of power output.

HEATING DEGREE DAY – A unit that measures the space heating needs during a given period of time.

HEATING LOAD – The rate at which heat must be added to a space in order to maintain the desired temperature within the space.

HEATING SEASONAL PERFORMANCE FACTOR – A representation of the total heating output of a central air-conditioning heat pump in BTUs during its normal usage period for heating, divided by the total electrical energy input in watt-hours during the same period, as determined using the test procedure specified in the California Code of Regulations, Title 20, Section 1603(c).

HVAC (Heating Ventilation and Air Conditioning) – A system that provides heating, ventilation and/or cooling within or associated with a building.

HYDROELECTRIC POWER – Electricity produced by falling water that turns a turbine generator. Also referred to as HYDRO.

INCANDESCENT LAMP – An electric lamp in which a filament is heated by an electric current until it emits visible light.

INDEPENDENT POWER PRODUCER – An Independent Power Producer (IPP) generates power that is purchased by an electric utility at wholesale prices. The utility then resells this power to end-use customers. Although IPPs generate power, they are not franchised utilities; government agencies or QFs. IPPs usually do not own transmission lines to transmit the power that they generate.

INDEPENDENT SYSTEM OPERATOR (ISO) – An ISO is the entity charged with reliable operation of the grid and provision of open transmission access to all market participants on a non-discriminatory basis. The California ISO is located at Folsom, California.

INTERCHANGE (Electric utility) – The agreement among interconnected utilities under which they buy, sell and exchange power among themselves. This can, for example, provide for economy energy and emergency power supplies.

INTERCONNECTION (Electric utility) – The linkage of transmission lines between two utilities, enabling power to be moved in either direction. Interconnections allow the utilities to help contain costs while enhancing system reliability.

INTEGRATED RESOURCE PLANNING (IRP) – A public planning process and framework within which the costs and benefits of both demand- and supply-side resources are evaluated to develop the least-total-cost mix of utility resource options. In many states, IRP includes a means for considering environmental damages caused by electricity supply/transmission and identifying cost-effective energy efficiency and renewable energy alternatives. IRP has become a formal process prescribed by law in some states and under some provisions of the Clean Air Act amendments of 1992.

INTERRUPTIBLE SERVICE (Electric utility) – Electricity supplied under agreements that allow the supplier to curtail or stop service at times.

INTERVAL METERING – The process by which power consumption is measured at regular intervals in order that specific load usage for a set period of time can be determined.

INVESTER OWNED UTILITY – A company, owned by stockholders for profit, that provides utility services. A designation used to differentiate a utility owned and operated for the benefit of shareholders from municipally owned and operated utilities and rural electric cooperatives.

INDEPENDENT SYSTEM OPERATOR (ISO) – A neutral operator responsible for maintaining instantaneous balance of the grid system. The ISO performs its function by controlling the dispatch of flexible plants to ensure that loads match resources available to the system.

KILOVOLT (kv) – One-thousand volts (1,000). Distribution lines in residential areas usually are 12 kv (12,000 volts).

KILOWATT (kW) – One thousand (1,000) watts. A unit of measure of the amount of electricity needed to operate given equipment. On a hot summer afternoon a typical home, with central air conditioning and other equipment in use, might have a demand of four kW each hour.

KILOWATT-HOUR (kWh) – The most commonly-used unit of measure telling the amount of electricity consumed over time. It represents one kilowatt of electricity supplied for one hour. A typical San Diego home consumes about 500 kilowatt-hours per month.

LANDFILL GAS – Gas generated by the natural degrading and decomposition of municipal solid waste by anaerobic microorganisms in sanitary landfills. The gases produced, carbon dioxide and methane, can be collected by a series of low-level pressure wells and can be processed into a medium Btu gas that can be burned to generate steam or electricity.

LOAD CENTERS – A geographical area where large amounts of power are drawn by end-users.

LIFE-CYCLE COST – Amount of money necessary to own, operate and maintain a building over its useful life.

LIFE EXTENSION – A term used to describe capital expenses, which reduce operating and maintenance costs associated with continued operation of electric utility boilers. Such boilers usually have a 40-year operating life under normal circumstances.

LIQUEFIED NATURAL GAS (LNG) – Natural gas that has been condensed to a liquid, typically by cryogenically cooling the gas to minus 327.2 degrees Fahrenheit (below zero).

LOAD (1) – The amount of electric power supplied to meet one or more end user's needs.

LOAD (2) – An end-use device or an end-use customer that consumes power. Load should not be confused with demand, which is the measure of power that a load receives or requires.

LOAD DIVERSITY – The condition that exists when the peak demands of a variety of electric customers occur at different times. This is the objective of "load molding" strategies, ultimately curbing the total capacity requirements of a utility.

LOAD FACTOR – A percent telling the difference between the amount of electricity a consumer used during a given time span and the amount that would have been used if the usage had stayed at the consumer's highest demand level during the whole time. The term also is used to mean the percentage of capacity of an energy facility—such as power plant or gas pipeline—that is utilized in a given period of time.

LOAD MANAGEMENT – Steps taken to reduce power demand at peak load times or to shift some of it to off-peak times. This may be with reference to peak hours, peak days or peak seasons. The main thing affecting electric peaks is air-conditioning usage, which is therefore a prime target for load management efforts. Load management may be pursued by persuading consumers to modify behavior or by using equipment that regulates some electric consumption.

LOAD SHIFTING – A load shape objective that involves moving loads from peak periods to off-peak periods. If a utility does not expect to meet its demand during peak periods but has excess capacity in the off-peak periods, this strategy might be considered

LUMEN – A measure of the amount of light available from a light source equivalent to the light emitted by one candle.

LUMENS/WATT – A measure of the efficacy of a light fixture; the number of lumens output per watt of power consumed.

LUMINAIRE – A complete lighting unit consisting of a lamp or lamps together with the parts designed to distribute the light, to position and protect the lamps and to connect the lamps to the power supply. California Code of Regulations, Section 2-1602(h)].

MARGINAL COST – The sum that has to be paid the next increment of product of service. The marginal cost of electricity is the price to be paid for kilowatt-hours above and beyond those supplied by presently available generating capacity.

MARKETER – An agent for generation projects who markets power on behalf of the generator. The marketer may also arrange transmission, firming or other ancillary services as needed. Though a marketer may perform many of the same functions as a broker, the difference is that a marketer represents the generator while a broker acts as a middleman.

MARGINAL COST – In the utility context, the cost to the utility of providing the next (marginal) kilowatt-hour of electricity, irrespective of sunk costs.

MARKET CLEARING PRICE – The price at which supply equals demand in the Day Ahead and Hour Ahead Markets.

MARKET PENETRATION – The incidence of adoption of a new technology or practice as a percent of the total eligible market size.

MARKET POWER – The ability of one or more suppliers and traders to manipulate or game the market to serve their own benefit.

MAXIMUM DEMAND – Highest demand of the load within a specified period of time.

MCF – One thousand cubic feet of natural gas, having an energy value of one million Btu. A typical home might use six MCF in a month.

MEGAWATT (MW) – One thousand kilowatts (1,000 kW) or one million (1,000,000) watts. One megawatt is enough energy to power 1,000 average California homes.

MEGAWATT HOUR (MWH) – One thousand kilowatt-hours, or an amount of electricity that would supply the monthly power needs of a typical home having an electric hot water system.

METER – A device for measuring levels and volumes of a customer¼s gas and electricity use.

MICROTURBINES – A small turbine engine used to produce power at a customer facility.

REAL TIME METER – A meter that can measure instantaneous loads at certain intervals.

METHANE (CH4) – the simplest of hydrocarbons and the principal constituent of natural gas. Pure methane has a heating value of 1,1012 Btu per standard cubic foot.

MUNICIPAL ELECTRIC UTILITY – A power utility system owned and operated by a local jurisdiction.

MUNICIPAL SOLID WASTE – Locally collected garbage, which can be processed and burned to produce energy.

MUNICIPALIZATION – The process by which a municipal entity assumes responsibility for supplying utility service to its constituents. In supplying electricity, the municipality may generate and distribute the power or purchase wholesale power from other generators and distribute it.

MUNICIPAL UTILITY – A provider of utility services owned and operated by a municipal government.

NATURAL GAS – Hydrocarbon gas found in the earth, composed of methane, ethane, butane, propane and other gases.

NATURAL MONOPOLY – A situation where one firm can produce a given level of output at a lower total cost than can any combination of multiple firms. Natural monopolies occur in industries, which exhibit decreasing average long-run costs due to size (economies of scale). According to economic theory, a public monopoly governed by regulation is justified when an industry exhibits natural monopoly characteristics.

NET CAPABILITY – Maximum load carrying ability of the equipment, excluding station use.

NET GENERATION – Gross generation minus the energy consumed at the generating station for its use.

NONRESIDENTIAL BUILDING – any building which is heated or cooled in its interior, and is of an occupancy type other than Type H, I, or J, as defined in the Uniform Building Code, 1973 edition, as adopted by the International Conference of Building Officials.

NON-FIRM ENERGY – Electricity that is not required to be delivered or to be taken under the terms of an electric purchase contract.

NORTH BAJA PIPELINE PROJECT – A major pipeline from Arizona to North Baja California that runs parallel to the US/Mexican border – but is located in Mexico.

NOx – Oxides of nitrogen that are a chief component of air pollution that can be produced by the burning of fossil fuels. Also called nitrogen oxides. NOx is a precursor to Ozone – a public health threat.

OCCUPANCY SENSOR – A control device that senses the presence of a person in a given space, commonly used to control lighting systems in buildings.

OFF-PEAK – Periods of relatively low system demands.

ON-PEAK ENERGY – Energy supplied during periods of relatively high system demand as specified by the supplier.

OPTIONS – An option is a contractual agreement that gives the holder the right to buy (call option) or sell (put option) a fixed quantity of a security or commodity (for example, a commodity or commodity futures contract), at a fixed price, within a specified period of time. May either be standardized, exchange-traded, and government regulated, or over-the-counter customized and non-regulated.

OTAY MESA PLANT – A 510 MW power plant slated for on line operation by December 31, 2004. The developer and owner is Calpine. The plant will be located in Chula Vista, in South San Diego County.

OUTAGE (Electric utility) – An interruption of electric service that is temporary (minutes or hours) and affects a relatively small area (buildings or city blocks).

OZONE – A kind of oxygen that has three atoms per molecule instead of the usual two. Ozone is a poisonous gas, but the ozone layer in the upper atmosphere shields life on earth from deadly ultraviolet radiation from space. The molecule contains three oxygen atoms (O3).

PARALLEL PATH FLOW – As defined by NERC, this refers to the flow of electric power on an electric system's transmission facilities resulting from scheduled electric power transfers between two other electric systems. (Electric power flows on all interconnected parallel paths in amounts inversely proportional to each path's resistance.)

PARTIAL LOAD – An electrical demand that uses only part of the electrical power available. [See California Code of Regulations, Title 24, Section 2-5342(e) 2]

PARTICULATE MATTER (PM) – Unburned fuel particles that form smoke or soot and stick to lung tissue when inhaled. A chief component of exhaust emissions from heavy-duty diesel engines.

PASSIVE SOLAR ENERGY – Use of the sun to help meet a building's energy needs by means of architectural design (such as arrangement of windows) and materials (such as floors that store heat, or other thermal mass).

PASSIVE SOLAR SYSTEM – A solar heating or cooling system that uses no external mechanical power to move the collected solar heat.

PERFORMANCE-BASED REGULATION (PBR) – Any rate-setting mechanism that attempts to link rewards (generally profits) to desired results or targets. PBR sets rates, or components of rates, for a period of time based on external indices rather than a utility's cost-of-service. Other definitions include light-handed regulation that is less costly and less subject to debate and litigation. A form of rate regulation which provides utilities with better incentives to reduce their costs than does cost-of-service regulation.

PEAK DEMAND – See PEAK LOAD.

PEAK LOAD – The highest electrical demand within a particular period of time. Daily electric peaks on weekdays occur in late afternoon and early evening. Annual peaks occur on hot summer days.

"PEAKER" – A power generating station that is normally used to produce extra electricity during peak load times.

PEAKING CAPACITY – Generating equipment normally operated only during the hours of highest daily, weekly, or seasonal loads; this equipment is usually designed to meet the portion of load that is above base load.

PEAKING UNIT – A power generator used by a utility to produce extra electricity during peak load times.

PHOTOVOLTAIC CELL – A semiconductor that converts light directly into electricity.

PIPELINE – A line of pipe with pumping machinery and apparatus (including valves, compressor units, metering stations, regulator stations, etc.) for conveying a liquid or gas.

POWER – Electricity for use as energy.

POWER GRID – A network of power lines and associated equipment used to transmit and distribute electricity over a geographic area.

POWER PLANT (Note: Two separate words, not one word.) – A central station generating facility that produces energy.

POWER POOL – An interstate or regional power exchange where wholesale power is bought and sold. Scheduling and settlement and regional transmission coordination also occurs. The pool may own, manage and/or operate the transmission lines ("wires") or be an independent entity that manages the transactions between entities. Often, the power pool is not meant to provide transmission access and pricing, or settlement mechanisms if differences between contracted volumes among buyers and sellers exist.

POWER PURCHASE AGREEMENT – This refers to a contract entered into by an independent power producer and an electric utility for buying and selling power.

PPM (PARTS PER MILLION) – The unit commonly used to represent the degree of pollutant concentration where the concentrations are small.

PREFERRED DAY-AHEAD SCHEDULE – A Scheduling Coordinator's preferred schedule for the ISO day-ahead scheduling process.

PRICE CAP – Situation where a price has been determined and fixed.

PROGRAMMABLE CONTROLLER – A device that controls the operation of electrical equipment (such as air conditioning units and lights) according to a preset time schedule.

PROVIDER OF LAST RESORT – A legal obligation (traditionally given to utilities) to provide service to a customer where competitors have decided they do not want that customer's business.

PUMPED HYDROELECTRIC STORAGE – Commercial method used for large-scale storage of power. During off-peak times, excess power is used to pump water to a reservoir. During peak times, the reservoir releases water to operate hydroelectric generators.

PURPA (The Public Utility Regulatory Policy Act of 1978) – Among other things, this federal legislation requires utilities to buy electric power from private "qualifying facilities," at an avoided cost rate. This avoided cost rate is equivalent to what it would have otherwise cost the utility to generate or purchase that power themselves. Utilities must further provide customers who choose to self-generate a reasonably priced back-up supply of electricity.

QUALIFYING FACILITY – QFs are non-utility power producers that often generate electricity using renewable and alternative resources, such as hydro, wind, solar, geothermal, or biomass (solid waste). QFs must meet certain operating, efficiency, and fuel-use standards set forth by the Federal Energy Regulatory Commission (FERC). If they meet these FERC standards, utilities must buy power from them. QFs usually have long-term contracts with utilities for the purchase of this power, which is among the utility's highest-priced resources.

R-VALUE – A unit of thermal resistance used for comparing insulating values of different material. It is basically a measure of the effectiveness of insulation in stopping heat flow. The higher the R-value number, a material, the greater its insulating properties and the slower the heat flow through it. The specific value needed to insulate a home depends on climate, type of heating system and other factors.

RADIANT ENERGY – Energy transferred by the exchange of electromagnetic waves from a hot or warm object to one that is cold or cooler. Direct contact with the object is not necessary for the heat transfer to occur.

RADIATION – The flow of energy across open space via electromagnetic waves such as light. Passage of heat from one object to another without warming the air space in between.

RATE BASE – Value of property upon which a utility is permitted to earn a specific rate of return.

RATE CLASS – A group of customers identified as a class and subject to a rate different from the rates of other groups.

RATE STRUCTURE – The design and organization of billing charges by customer class to distribute the revenue requirement among customer classes and rating period.

RATEPAYER – This is a retail consumer of the electricity distributed by an electric utility. This includes residential, commercial and industrial users of electricity.

REAL-TIME MARKET – The competitive generation market controlled and coordinated by the ISO for arranging real-time imbalance energy.

REAL-TIME PRICING – The instantaneous pricing of electricity based on the cost of the electricity available for use at the time the electricity is demanded by the customer.

REFRIGERANT – A fluid such as freon that is used in cooling devices to absorb heat from surrounding air or liquids as it evaporates.

RELIABILITY MUST-RUN GENERATION – Utilities will be allowed to generate electricity when hydro resources are spilled for fish releases, irrigation, and agricultural purposes, and to generate power that is required by federal or state laws, regulations, or jurisdictional authorities. Such requirements include

hydrological flow requirements, irrigation and water supply, solid-waste generation, or other generation contracts in effect on December 20, 1995.

RELIABILITY – Electric system reliability has two components – adequacy and security. Adequacy is the ability of the electric system to supply the aggregate electrical demand and energy requirements of the customers at all times, taking into account scheduled and unscheduled outages of system facilities. Security is the ability of the electric system to withstand sudden disturbances such as electric short circuits or unanticipated loss of system facilities.

RELIABILITY MUST-RUN GENERATION/Unit (RMR) – Generating units that the owner must have available to run when called upon by the ISO to meet reserve and reliability requirements.

RENEWABLE ENERGY – Resources that constantly renew themselves or that are regarded as practically inexhaustible. These include solar, wind, geothermal, hydro and wood. Although particular geothermal formations can be depleted, the natural heat in the earth is a virtually inexhaustible reserve of potential energy. Renewable resources also include some experimental or less-developed sources such as tidal power, sea currents and ocean thermal gradients.

RENEWABLE RESOURCES – Renewable energy resources are naturally replenishable, but flow-limited. They are virtually inexhaustible in duration but limited in the amount of energy that is available per unit of time. Some (such as geothermal and biomass) may be stock-limited in that stocks are depleted by use, but on a time scale of decades, or perhaps centuries, they can probably be replenished. Renewable energy resources include: biomass, hydro, geothermal, solar and wind. In the future they could also include the use of ocean thermal, wave, and tidal action technologies. Utility renewable resource applications include bulk electricity generation, on-site electricity generation, distributed electricity generation, non-grid-connected generation, and demand-reduction (energy efficiency) technologies.

REPOWERING – Either refurbishing or replacement of generating equipment, controls, water intakes and cooling system to improve efficiency and lower emissions. Repowering can result in a 30% efficiency or heat rate improvement.

RESERVE – The extra generating capability that an electric utility needs, above and beyond the highest demand level it is required to supply to meet its usersº needs.

RESERVE MARGIN – The differences between the dependable capacity of a utility's system and the anticipated peak load for a specified period.

RESTRUCTURING – The reconfiguration of the vertically-integrated electric utility. Restructuring usually refers to separation of the various utility functions into individually operated and -owned entities.

RETAIL COMPETITION – A system under which more than one electric provider can sell to retail customers, and retail customers are allowed to buy from more than one provider. (See also direct access)

RETAIL MARKET – A market in which electricity and other energy services are sold directly to the end-use customer.

Seasonal Energy Efficiency Ratio (SEER) –The total cooling output of a central air conditioning unit in BTUs during its normal usage period for cooling divided by the total electrical energy input in watt-hours during the same period, as determined using specified federal test procedures. [See California Code of Regulations, Title 20, Section 1602(c)(11)]

SETTLEMENT – The process of financial settlement for products and services purchased and sold. Each settlement involves a price and quantity. Both the ISO and PX may perform settlement functions.

SET POINT – Scheduled operating level for each generating unit or other resource scheduled to run in the Hour-ahead Schedule.

SLACK CAPACITY – The amount of pipeline capacity in excess of demand that is needed generate the benefits of competition. There is no slack capacity when all existing available capacity is used to meet demand. When there is no slack capacity consumers loose the benefits of competition and gas prices will dramatically increase. Need sufficient reserves for a competitive market to function.

SOLAR COLLECTOR – A component of an active or passive solar system that absorbs solar radiation to heat a transfer medium which, in turn, supplies heat energy to the space or water heating system.

SOLAR CELL – A photovoltaic cell that can convert light directly into electricity. A typical solar cell uses semiconductors made from silicon.

SOLAR COLLECTOR – A surface or device that absorbs solar heat and transfers it to a fluid. The heated fluid then is used to move the heat energy to where it will be useful, such as in water or space heating equipment.

SOLAR ENERGY – Heat and light radiated from the sun.

SOLAR HEAT GAIN – Heat added to a space due to transmitted and absorbed solar energy.

SOLAR HEATING AND HOT WATER SYSTEMS – Solar heating or hot water systems provide two basic functions: (a) capturing the sun's radiant energy, converting it into heat energy, and storing this heat in insulated storage tank(s); and (b) delivering the stored energy as needed to either the domestic hot water or heating system. These components are called the collection and delivery subsystems.

SOLAR IRRADIATION – The amount of radiation, both direct and diffuse, that can be received at any given location.

SOLAR POWER – Electricity generated from solar radiation.

SOLAR RADIATION – Electromagnetic radiation emitted by the sun.

SOLAR THERMAL POWER PLANT – means a thermal power plant in which 75 percent or more of the total energy output is from solar energy and the use of backup fuels, such as oil, natural gas, and coal, does not, in the aggregate, exceed 25 percent of the total energy input of the facility during any calendar year period.

SOLAR THERMAL – The process of concentrating sunlight on a relatively small area to create the high temperatures needs to vaporize water or other fluids to drive a turbine for generation of electric power.

SO_x – Oxides of sulfur that are component of air pollution that can be produced by the burning of fossil fuels. Also called sulfur dioxide. SOx is known to cause smog and acid rain and is more predominant in burning of fuels in vehicles and power plants that burn coal and oil.

STEAM ELECTRIC PLANT – A power station in which steam is used to turn the turbines that generate electricity. The heat used to make the steam may come from burning fossil fuel, using a controlled nuclear reaction, concentrating the sun's energy, tapping the earth's natural heat or capturing industrial waste heat.

STORAGE TYPE WATER HEATER – A water heater that heats and stores water at a thermostatically controlled temperature for delivery on demand. [See California Code of Regulations, Title 20, Section 1602(f)(6)]

STRANDED COSTS/STRANDED ASSETS – See embedded Costs Exceeding Market Prices.

SUBSTATION – A facility that steps up or steps down the voltage in utility power lines. Voltage is stepped up where power is sent through long-distance transmission lines. It is stepped down where the power is to enter local distribution lines.

SYSTEM – A combination of equipment and/or controls, accessories, interconnecting means and terminal elements by which energy is transformed to perform a specific function, such as climate control, service water heating, or lighting. [See California Code of Regulations, Title 24, Section 2-5302]

TAKE AWAY CAPACITY – Ability of California natural gas transmission companies to take gas supply form the California border and distribute it to local distribution utilities. The state generally needs to work on improving its intrastate take away capacity.

TARIFF – A document, approved by the responsible regulatory agency, listing the terms and conditions, including a schedule of prices, under which utility services will be provided.

THERM – One hundred thousand (100,000) British thermal units (1 therm = 100,000 Btu).

THERMAL POWER PLANT – any stationary or floating electrical generating facility using any source of thermal energy, with a generating capacity of 50 megawatts or more, and any facilities appurtenant thereto. Exploratory, development, and production wells, resource transmission lines, and other related facilities used in connection with a geothermal exploratory project or a geothermal field development project is not appurtenant facilities for the purposes of this division. Thermal power plant does not include any wind, hydroelectric, or solar photovoltaic electrical generating facility.

TON OF COOLING – A useful cooling affect equal to 12,000 Btu hours.

TIME-OF-USE METER – A measuring device that records the times during which a customer uses various amounts of electricity. This type of meter is used for customers who pay time-of-use rates.

TIME-OF-USE RATES – Electricity prices that vary depending on the time periods in which the energy is consumed. In a time-of- use rate structure, higher prices are charged during utility peak-load times. Such rates can provide an incentive for consumers to curb power use during peak times.

TITLE 24 – The State of California's Building Code that ensures compliance with energy standards, developed and administered by the California Energy Commission.

TRANSMISSION – Transporting bulk power over long distances.

TRANSMISSION CONSTRAINT – Transmission line capacity limitations that prevent power from being delivered to markets where needed. Usually results in curtailments and higher prices.

TURBINE GENERATOR – A device that uses steam, heated gases, water flow or wind to cause spinning motion that activates electromagnetic forces and generates electricity.

UDC (Utility distribution company) – An entity that owns a distribution system for the delivery of energy to and from the ISO-controlled grid, and that provides regulated, retail service to eligible end-use customers who are not yet eligible for direct access, or who choose not to arrange services through another retailer.

UTILITY – A regulated entity, which exhibits the characteristics of a natural monopoly. For the purposes of electric industry restructuring, "utility" refers to the regulated, vertically integrated electric company. "Transmission utility" refers to the regulated owner/operator of the transmission system only. "Distribution utility" refers to the regulated owner/operator of the distribution system, which serves retail customers.

VAV System (Variable Air Volume System) – A mechanical HVAC system capable of serving multiple zones which controls the temperature maintained in a zone by controlling the amount of heated or cooled air supplied to the zone.

VENTILATION – The process of supplying or removing air by natural or mechanical means to or from any space. Such air may or may not have been conditioned or treated.

VOLT – A unit of electromotive force. It is the amount of force required to drive a steady current of one ampere through a resistance of one ohm. Electrical systems of most homes and office have 120 volts.

VOLTAGE OF A CIRCUIT (Electric utility) – The electric pressure of a circuit, measured in volts. Volts are analogous to water pressure or flow rate.

WATT – A unit of measure of electric power at a point in time, as capacity or demand.

WATT-HOUR – One watt of power expended for one hour.

WEATHERSTRIPPING – Specially designed strips, seals and gaskets installed around doors and windows to limit air leakage.

WHEELING – The transmission of electricity owned by a third party to another buyer.

WHOLESALE POWER MARKET – The purchase and sale of electricity from generators to resellers (who sell to retail customers) along with the ancillary services.

WIRES CHARGE – A broad term, which refers to charges levied on power suppliers or their customers for the use of the transmission or distribution wires.

WESTERN SYSTEM COORDINATING COUNCIL (WSCC) – A voluntary industry association created to enhance reliability among western utilities.

Appendix D: Demand and Generation Scenarios and Forward Prices

D.1 Background

This section presents the demand forecast methodology that was used for estimating the electric demand in each of three scenarios. The demand forecast, as noted earlier, consisted of using the SDG&E 50-50 forecast up until 2006 and then using the CEC forecast for years beyond. To complete a sensitivity 1.8 percent for the low forecast, 2.0 percent for the medium forecast and 2.5 percent for the high demand forecast.

D.2 Electric and Demand Scenario Forecasts

D.2.1 Electric Forecast

Figure D-1 presents the electric load forecast. Data for this forecast, except the adjustments for the sensitivity analyses came from SDG&E and the CEC. This forecast includes losses and excludes the 15% reserves.

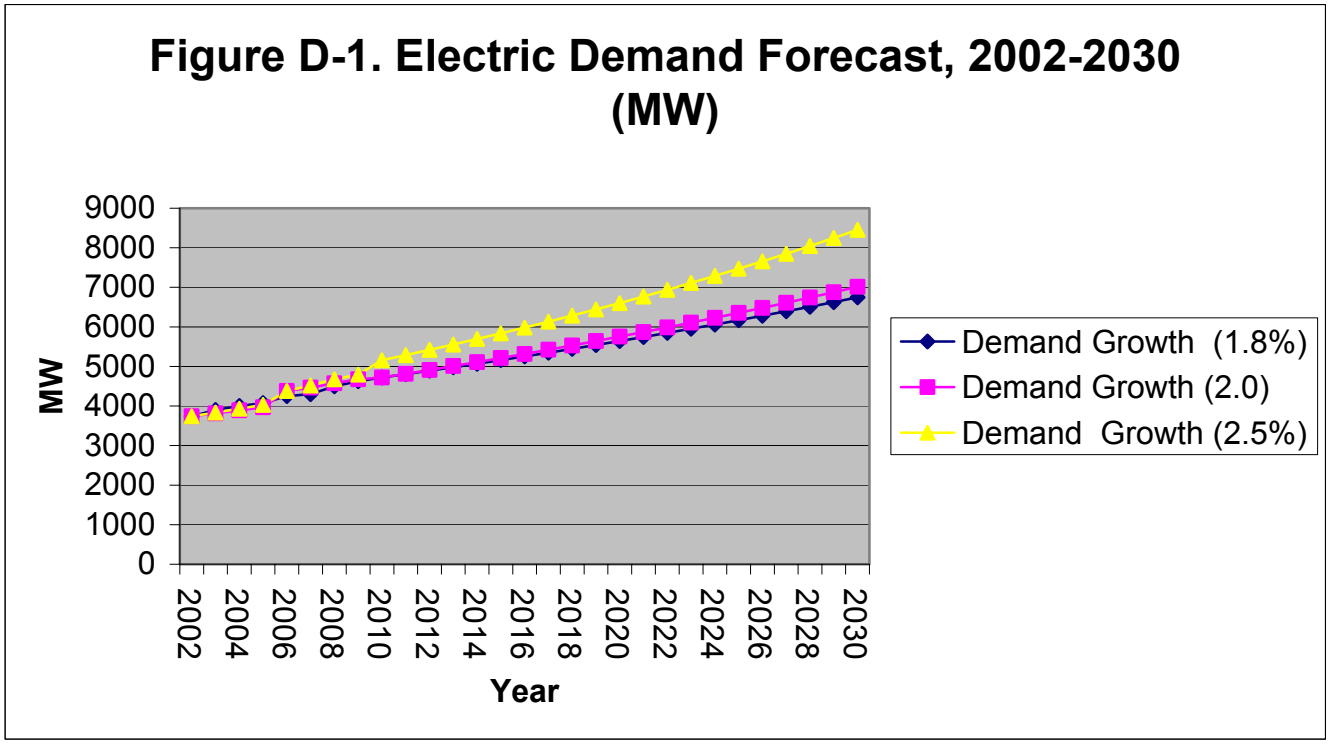
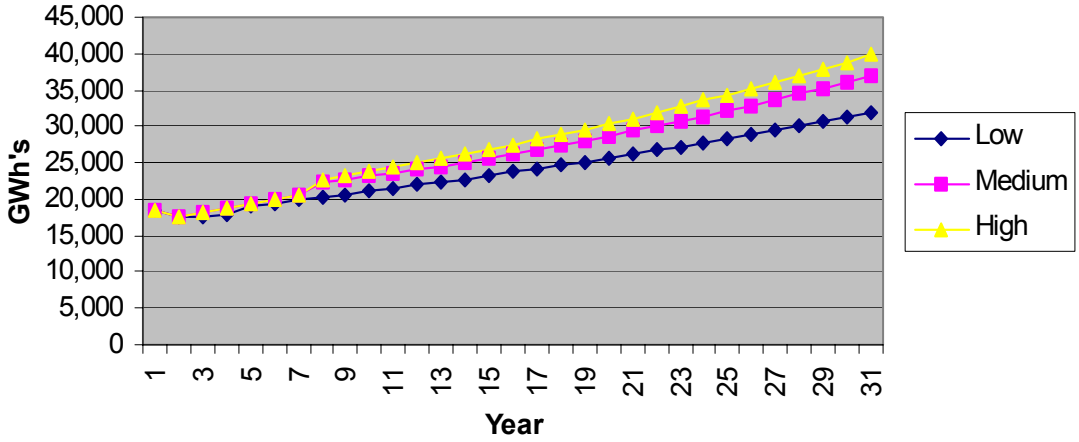


Figure D-2 presents the estimated projection for electric consumption. The total GWh of electric sales range from 32,000 GWh to 42,000 GWh in 2030. These sales projections are comparable to the CEC sales forecasts. While the CEC assumed an average growth rate of 2.3 percent, SAIC used 2.0, 2.3, and 2.5, percent as the basis of its low, medium, and high projections, respectively.

Figure D-2. Electric Sales Projection (2000–3030) GWh



D.2.2 Natural Gas Forecast

Table D-1 presents the natural gas forecast by scenario. The low scenario uses a 1.0-percent growth rate. The medium scenario uses a 1.2-percent growth rate and the high scenario uses a 1.5-percent growth rate. The use of gas for power plants may also serve to increase gas load. On the margin, the growth of new power plants in the region that use natural gas could be the largest single growth area. Another potentially important driver for growth is the use of natural gas for cogeneration. This compares to about 40 percent of today's load, according to SDG&E.

Table D-1. Total Historical and Projected Retail Sales Estimate (MMTherms)

Year	Natural Gas Retail Sales Scenarios			Maximum Daily Sendout		
	Low Case 1.00%	Medium Case 1.20%	High Case 1.40%	Low	Medium	High
1995	703	703	703		286	
1996	697	697	697		300	
1997	713	713	713		320	
1998	721	721	721		317	
1998	729	729	729		313	
2000	734	734	734		320	
2001	694	694	694		308	
2002	756	756	756		327	
2003	764	765	767		336	
2004	771	774	777		339	
2005	779	784	788		343	
2006	787	793	799		348	
2010	819	832	845	365	368	371
2020	904	944	967	411	417	435
2030	999	1003	1037	464	479	509

The growth rates for maximum winter peak day sendout are estimated to be 1.2, 1.4, and 1.6 percent, for the low, medium, and high scenarios.

Residential use of natural gas may grow at a rate of about 0.5 percent and commercial uses are projected to grow at a rate of 2.0 to 5.0 percent per year.[1]

[1] The 5% growth rate is provided by SDG&E.

D.3 Electric Capacity and Energy Forward Prices

This section presents a short description of the following:

- Electric forward pricing methodology employed
- Areas modeled
- Key Assumptions
- Results.

D.3.1 Methodology Employed

SAIC used the Market Power dispatch model, which was developed by New Energy Associates of Atlanta, Georgia. This model simulates electric energy and capacity prices using a dispatch algorithm. The specific algorithm employed uses a linear programming technique. A typical weekday and weekend day is modeled for every month of every year. Hourly periods were specified for 2-hour periods (e.g., Hours 1–2, 3–4, etc.). These periods were then combined for specific analyses. The period 2002 through 2030 was modeled.

D.3.2 Areas Modeled

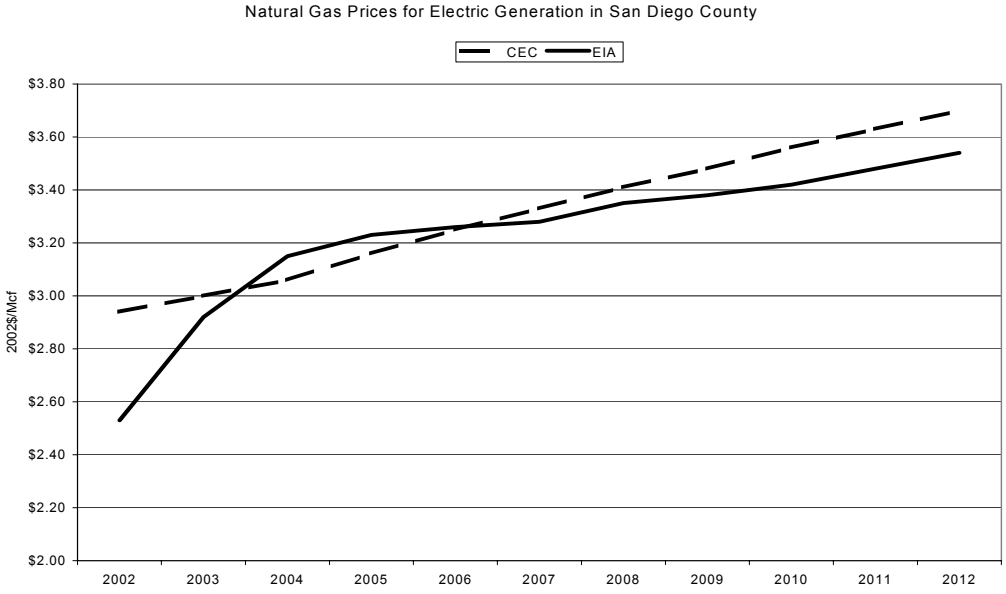
In order to capture the behavior of the area electricity market, SAIC modeled the entire WSCC, including British Columbia, Alberta; and Baja California. The total generation in this region totaled 164,000 MW in 2000.

D.3.3 Assumptions

The base case natural gas price forecast was adopted from the CEC projections. These projections are produced from a general equilibrium model of the western United States. An alternative gas price forecast scenario was also prepared and used based upon projections form the U.S. DOE-EIA. These projections are based upon a general equilibrium model of North America.

The *CEC natural gas price projections* (Figure D-3) provided pricing points for all regions modeled in the WSCC. The EIA forecast used basis differentials constructed from Gas Daily pricing points. All natural gas price forecasts conformed to the CEC inflation forecast.

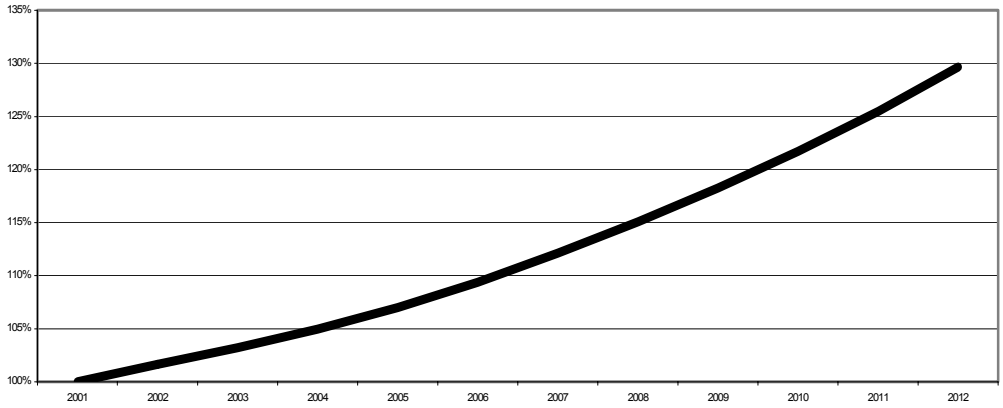
Figure D-3. Natural Gas Price Forecast



Other fuel forecasts were adopted from sources such as RDI or the EIA. In general, these other fuels (residual oil, distillate oil, coal, and uranium) are not establishing the market price in this region.

SAIC adopted the *CEC inflation forecast (Figure D-4)*. This forecast averaged increases of 2.4 percent per year for the period 2001 through 2012. SAIC extrapolated additional growth rates from 2013–2030.

Figure D-4. Inflation Forecast Used



New generating units identified in the State of California were based upon a developer consensus estimate. This estimate was made based upon communications with marketers about specific projections (both their own and competitors), which would be completed. Projects outside of California were identified through various databases and other public information sources. The plants that were included in the analysis were:

- 20,952 MW of planned generation was identified to come online
- After January 2002 in the WSCC, 7,112 MW of that capacity is located in California.

Market Power creates an optimal generation expansion plan based upon the assumptions and parameters entered into the model. SAIC identified the following technologies as potential new generation additions in our analysis.

- A simple-cycle combustion turbine and combined cycle combustion turbine, which could be constructed in all areas except California.
- Simple- and combined-cycle combustion turbines, which could be constructed in California. These units are more expensive due to higher construction costs and more stringent emissions standards.
- A coal plant, which could be constructed in the Rockies and Montana/Wyoming.

SDG&E's peak demand and energy forecast was adopted until 2006. After that time period the CEC forecast was used. For the other California utilities the CEC forecast was adopted.

For non-California entities the Form 714 forecasts filed with the FERC were used.

Transmission interconnection capacities for the WSCC were adopted from various sources. San Diego County specific-transfer capabilities were confirmed by discussions with SDG&E personnel, including proposed projects such as Rainbow Valley. A transmission tariff of $3/MWh between regions was adopted. Transfers within regions were assumed to have a marginal price of zero.

D.3.4 Results

The following forward price analysis was produced in this study

- A base case using CEC gas price projections and standard assumptions regarding identified new generation and prototype new generation. The CEC forecast and GADS data standard forced outage rates were used. This is the definitive forecast in California, with details specific to the west coast, including delivered gas prices from San Juan basin and local distribution fees.
- An alternative gas price scenario using EIA projections of natural gas prices. A lower forecast for generation is based on a general equilibrium model for North America.
- An alternative scenario assuming a higher IRR for California generation based upon political uncertainty. This scenario captures fact that there may be more risk in building plants in California than other Western states due to public comments about eminent domain, power contract negotiations, etc.
- An alternative scenario based upon a reduced level of construction in the 2002–2005 time period. In this scenario the number of planned projects was cut by 50 percent over the short term and this increased to a 75-percent reduction level for the WSCC. This scenario shows what would happen if marketers were to take action to avoid boom or bust cycles, by holding back on new plant development.

D.4 Generating Plants in San Diego County (2002–2030)

Table D-2 presents a current database on the current and proposed retirements of generating plants in San Diego County.

Table D-2: Planned Generating Unit Capacity and Retirement Schedule for San Diego County, 2002–2030 (MW)

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Assumption: Steam units retired at 50 years -- triggers retirements of Cabrillo 1-2-3																		
Existing Steam Units																		
Cabrillo 1	106	106	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cabrillo 2	103	103	103	103	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cabrillo 3	109	109	109	109	109	109	-	-	-	-	-	-	-	-	-	-	-	-
Cabrillo 4	299	299	299	299	299	299	299	299	299	299	299	299	299	299	299	299	299	299
Cabrillo 5	329	329	329	329	329	329	329	329	329	329	329	329	329	329	329	329	329	329
South Bay 1	145	145	145	145	-	-	-	-	-	-	-	-	-	-	-	-	-	-
South Bay 2	149	149	149	149	-	-	-	-	-	-	-	-	-	-	-	-	-	-
South Bay 3	174	174	174	174	-	-	-	-	-	-	-	-	-	-	-	-	-	-
South Bay 4	221	221	221	221	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Steam Units	*1,635*	*1,635*	*1,529*	*1,529*	*737*	*737*	*628*	*628*	*628*	*628*	*628*	*628*	*628*	*628*	*628*	*628*	*628*	*628*
Assumption: GTs/Jets are replaced as retired																		
GTs and Jets																		
Coronado – North Island 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coronado – North Island 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Division GT	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
Cabrillo GT 1	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
Cabrillo GT 2	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
Kearny GT	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
Kearny GT	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
Kearny GT	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
Kearny GT	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
Kearny GT	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Kearny GT	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
Kearny GT	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
Kearny GT	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
Kearny GT	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Miramar	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17
Miramar	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
Naval Station	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NTC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
South Bay GT	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
Total GTs and Jets	*213*	*213*	*213*	*213*	*213*	*213*	*213*	*213*	*213*	*213*	*213*	*213*	*213*	*213*	*213*	*213*	*213*	*213*
QF / Cogen																		
Division	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47
Goal Line	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
North Island CG 1	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
Point Loma	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
Misc Customer Owned Capacity	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23
Total QF / Cogen	*175*	*175*	*175*	*175*	*175*	*175*	*175*	*175*	*175*	*175*	*175*	*175*	*175*	*175*	*175*	*175*	*175*	*175*
Peak Additions																		
Border / Larkspur	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49
Border / Larkspur	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49
Border / CalPeak	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49
Escondido / CalPeak	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49
El Cajon / CalPeak	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49
Ramco Escondido	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49
Ramco Chula Vista	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42
Total Peak Additions	*336*	*336*	*336*	*336*	*336*	*336*	*336*	*336*	*336*	*336*	*336*	*336*	*336*	*336*	*336*	*336*	*336*	*336*
Grand Total	**2,359**	**2,359**	**2,253**	**2,253**	**1,461**	**1,461**	**1,352**	**1,352**	**1,352**	**1,352**	**1,352**	**1,352**	**1,352**	**1,352**	**1,352**	**1,352**	**1,352**	**1,352**

Appendix E: Natural Gas System Data

Table E-1. Historical and Forecast Natural Gas Consumption (therms) (Actuals through 2001 shown in bold)

Year	Therms		
	Gas Consumption- Historical and Base Case (Medium Growth)	Low Forecast	High Forecast
1980	**884,838,871**		
1981	**890,951,453**		
1982	**852,637,463**		
1983	**836,676,815**		
1984	**955,109,954**		
1985	**982,763,151**		
1986	**826,639,955**		
1987	**1,102,397,691**		
1988	**997,726,138**		
1989	**1,091,808,659**		
1990	**1,042,618,290**		
1991	**1,077,300,837**		
1992	**1,149,227,489**		
1993	**1,129,262,891**		
1994	**1,109,782,269**		
1995	**1,092,255,316**		
1996	**1,128,056,473**		
1997	**1,195,106,695**		
1998	**1,328,633,088**		
1999	**1,271,444,933**		
2000	**1,414,204,156**		
2001	**1,449,559,260**	**1,449,559,260**	**1,449,559,260**
2002	1,478,550,445	1,471,302,649	1,485,798,241
2003	1,508,121,454	1,493,372,189	1,522,943,197
2004	1,538,283,883	1,515,772,771	1,561,016,777
2005	1,569,049,561	1,538,509,363	1,600,042,197
2006	1,600,430,552	1,561,587,003	1,640,043,252
2007	1,616,434,857	1,580,326,047	1,666,283,944
2008	1,632,599,206	1,599,289,960	1,692,944,487
2009	1,648,925,198	1,618,481,440	1,720,031,599
2010	1,665,414,450	1,637,903,217	1,747,552,104
2011	1,682,068,595	1,657,558,055	1,775,512,938
2012	1,698,889,281	1,677,448,752	1,803,921,145
2013	1,715,878,173	1,697,578,137	1,832,783,883
2014	1,733,036,955	1,717,949,075	1,862,108,425
2015	1,750,367,325	1,738,564,464	1,891,902,160
2016	1,767,870,998	1,759,427,237	1,922,172,595
2017	1,785,549,708	1,780,540,364	1,952,927,356
2018	1,803,405,205	1,801,906,848	1,984,174,194
2019	1,821,439,257	1,823,529,731	2,015,920,981
2020	1,839,653,650	1,845,412,087	2,048,175,717
2021	1,858,050,186	1,867,557,032	2,080,946,528
2022	1,876,630,688	1,889,967,717	2,114,241,673
2023	1,895,396,995	1,912,647,329	2,148,069,539
2024	1,914,350,965	1,935,599,097	2,182,438,652
2025	1,933,494,474	1,958,826,286	2,217,357,670
2026	1,952,829,419	1,982,332,202	2,252,835,393
2027	1,972,357,713	2,006,120,188	2,288,880,759
2028	1,992,081,290	2,030,193,631	2,325,502,852
2029	2,012,002,103	2,054,555,954	2,362,710,897
2030	2,032,122,124	2,079,210,626	2,400,514,272

Table E-2. Historical and Forecast Natural Gas Demand (actuals through 2001 shown in bold)

Natural Gas Demand by Scenario (MMBtu)			
Year	Low Case	Medium Case	High Case
1995	**703**	**703**	**703**
1996	**697**	**697**	**697**
1997	**713**	**713**	**713**
1998	**721**	**721**	**721**
1999	**729**	**729**	**729**
2000	**734**	**734**	**734**
2001	**694**	**694**	**694**
2002	704	708	711
2003	715	722	729
2004	726	736	747
2005	737	751	766
2006	748	766	785
2007	755	775	798
2008	763	785	811
2009	770	794	823
2010	778	804	837
2011	786	813	850
2012	794	823	864
2013	802	833	877
2014	810	843	892
2015	818	853	906
2018	826	863	920
2017	834	874	935
2018	842	884	950
2019	851	895	965
2020	859	905	981
2021	868	916	996
2022	877	927	1012
2023	885	938	1028
2024	894	950	1045
2025	903	961	1062
2026	912	973	1079
2027	921	984	1096
2028	931	996	1113
2029	940	1008	1131
2030	949	1020	1149

Figure E-1. System Map for SDG&E with Major Pipeline Interconnections

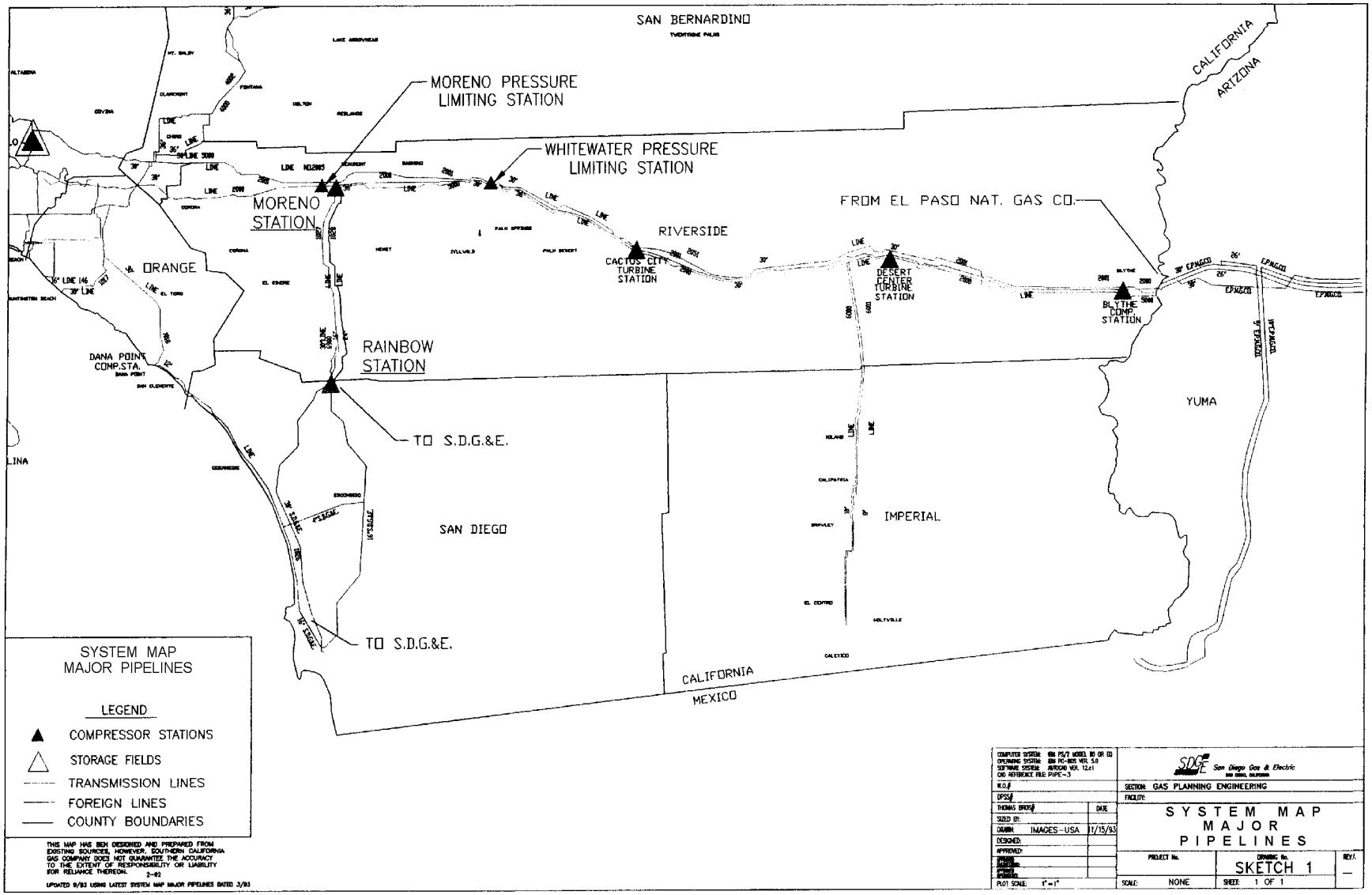


Table E-3. SDG&E Firm Service Day (FSD) Demand

1 in 10 year Recurrence Interval

Year	Core (MMcfd)	Firm Noncore C&I (MMcfd)	Firm EG (MMcfd)	Total (MMcfd)
2003	380	63	37	**480**
2004	379	63	38	**480**
2005	379	63	67	**509**
2006	382	63	100	**545**
2007	387	63	136	**586**
2008	393	63	170	**626**
2009	400	63	174	**637**
2010	407	63	177	**647**
2011	414	63	181	**658**
2012	421	63	184	**668**
2013	427	63	188	**678**
2014	434	63	192	**689**
2015	440	63	196	**699**
2016	446	63	199	**708**
2017	452	64	203	**719**

Description of SDG&E Potential Gas Infrastructure Projects

Rainbow to Escondido 30-inch pipeline

This pipeline would extend 23 miles from the Rainbow station and would tie in with the existing 16-inch line further south. The lead-time for this pipeline is 2 to 3 years, of course depending on various factors. The majority of this pipeline would be planned for installation in franchise rights of way (roadways). The cost of this project is estimated at $38 million, with only nominal operating and maintenance (O&M) costs. It would add about 45 MMcfd to the system capacity. It could also be extended further south and would be considered the first phase of the Rainbow to Santee line.

Rainbow to Fallbrook 30-inch pipeline

This pipeline would extend 15 miles from the Rainbow station to the Fallbrook area, and would tie into the existing 30-inch line at Fallbrook. The route would follow the existing 30-inch pipeline route, which does not follow franchise positions. Therefore it would require acquisition of right-of-way and environmental permitting, which will influence the 3- to 4-year lead-time estimate. Cost is approximately $29 million, and would add about 50 MMcfd to system capacity.

Rainbow to Santee 30-inch pipeline

Project #1 described above is the northern 23 miles of this project. The total length of this pipeline would be 49 miles, extended all the way to the existing 36-inch Pipeline 2000 in Santee. Essentially, this pipeline would complete a loop between the Rainbow Compressor station and the southern extreme of the SDG&E service territory. The project was discussed at length with SDG&E personnel and they confirmed this project as being the ideal project to significantly improve system reliability, especially in time of emergencies or when other transmission lines are in need of maintenance. The lead-time for this project is estimated at 3 to 4 years, with the southern portion being the most problematic since it goes through federal government property and various sensitive environmental zones. The cost of this entire project would be about $90 million and add 150 to 170 MMcfd to system capacity. Similar to Line 6900, this line could be built in phases, or increments, as demand increases over time.

Rainbow to Main Line Valve #7 30-inch and Miramar to Santee 30-inch pipeline

The 30-inch Rainbow to Main Line Valve #7 begins at Rainbow and extends 25 miles south to the existing 30-inch line in the vicinity of the City of Carlsbad. Project # 2 described above is the northern15 miles of this project. This pipeline would require significant environmental permitting and rights of way acquisition, causing lead times to run 3 to 4 years. Cost would be approximately $47 million, with only nominal O&M charges.

The 30-inch Miramar to Santee pipeline would be about 7.5 miles from the Miramar Marine Corps Air Station to the City of Santee. This pipeline would tie into the 30-inch transmission line at Miramar and the 36-inch line in Santee. Lead time estimated at 3 to 4 years. Cost of this project is about $15–20 million.

Both of these projects would add about 100–120 MMcfd capacity to the SDG&E system. Although this pipeline resembles a third transmission line into the SDG&E service territory like the Rainbow to Santee line, it does not go to the southern extreme end of the system. Therefore, it would not provide the same level of reliability of that line.

Carlsbad Compressor Station and Miramar to Santee 30-inch

This potential project would install a new 17,000 bhp station in the City of Carlsbad located south of Main Line Valve #7. The lead-time for this project is 3 to 4 years, but since this area is highly developed locating a compressor station there would be difficult. The initial capital expense is estimate at $34 million, however this facility would also incur about $4 million a year in annual operating expenses for labor, fuel, O&M, and emission compliance costs. The 30-inch diameter pipeline is the same as described in project 4 above. Combined with the compressor station, these two projects would add about 90 to 100 MMcfd of capacity to the system for a total cost of about $50 million.

Gas Regulatory Proceeding Summaries

1. Gas Industry Restructuring – D.01-12-018 Issued December 2001

This decision is a fundamental structural change in the gas industry, especially in Southern California. First, firm receipt point capacity will be auctioned off by SoCalGas. SDG&E customers will have the opportunity to bid for this capacity directly. Second, SDG&E customers can contract directly for storage on SoCalGas' system. Other existing noncore gas supply options will be eliminated such as noncore gas sales, and core subscription option. The GIR also represents a return to embedded cost ratemaking, at least for the SoCalGas system, albeit on the backbone transmission and storage systems only. The SDG&E fixed costs will remain as they are today on a LRMC ratemaking basis. Essentially non-core customers in San Diego County are losing direct utility service options.

2. SDG&E Gas System Investigation (I. 00-11-002)

This proceeding was prompted by the gas curtailments that occurred on the SDG&E system during the winter of 2000/2001. At the time of this report, a proposed decision had been released by the ALJ in the proceeding. No final CPUC decision has been issued. Many important issues to San Diego gas consumers will result from this proceeding, such as: reliability standards, curtailment rules, interruptible/firm service rates, firm capacity reservations/open seasons, expansion policies, and other issues. The ALJ proposed decision also orders SDG&E to file a written report every six months on its capacity planning, demand forecast, and the status of its expansion projects. No other utility in the state is required to do this, however this potential new CPUC directive may eventually apply to the other gas utilities in the state. Only the San Diego APCD and the two major power plants in San Diego were active in this proceeding, and their participation was mainly focused on gas curtailment priorities and issues related to electric generation.

3. SoCalGas/SDG&E BCAP Proceedings (delayed 2002 and upcoming 2003)

Biennial Cost Allocation Proceedings, or BCAPs, are critical to all gas customers in California. Although both SDG&E and SoCalGas filed their 2002 BCAP applications in late 2001, they were essentially made moot by the GIR decision in December. For that reason, both Sempra utilities completely re-filed their applications in March 2002. Upon a request by the CPUC staff organization ORA, a 1-year delay was requested—and granted by the CPUC, thus making these revised filing moot as well. Utility proposals in these 2002 BCAP applications were never entered into evidence, sponsored by witnesses, or had any discovery conducted on them, therefore we have to be careful in talking about them. BCAPs set the gas cost allocation for all ratepayers, including SDG&E as a wholesale customer of SoCalGas. Fundamentally it is a "zero sum game", meaning that once the total revenue requirement of the utility has been set, the cost allocation methodology recovers those costs from all customers, with one customer class paying more if another pays less. Therein lies much of the controversy between customer classes in a BCAP proceeding. BCAPs are the single most important proceeding for all gas consumers, including electric generators. This is the proceeding where the SEMPRA wide EG rate was established, resulting in a huge windfall for EGs on the SDG&E system, to the consternation of Los Angeles based EG customers. Proposals surfacing in the 2002 SDG&E BCAP included the proposed "peaking rate," potential transition to embedded cost ratemaking from current LRMC ratemaking, 15-year commitments by EG customers, and many more. Whether these issues are revisited in the 2003 BCAP remains to be seen.

4. SoCalGas/SDG&E Portfolio Consolidation Proceeding (A. 01-01-021)

Proposed in early 2001, this concept met little resistance by any party in hearings held mid-2001. The proceeding is essentially over, with the ALJ issuing a proposed decision approving the application. However, an alternate decision has also been issued which denies the application. After comments, this will be followed by the final CPUC decision. In a combined portfolio with SoCalGas, San Diego's gas consumers will comprise less than 10 percent of the total portfolio, which will mean the priority will be with SoCalGas customers. Historically, SDG&E has been more economical in buying natural gas than SoCalGas, except for Winter 2000 and 2001. However, SoCalGas' access to firm interstate capacity shielded its customers from the extreme run-up in gas commodity costs last winter. SDG&E will also no longer be providing any commodity sales to its noncore customers, which is a reduction of service options for them.

Appendix F: Power System Data

Table F-1. Power Plants Located in San Diego County

--NAME--	--KV--		-PMAX-		Owner	RMR Contract	CDWR Contract	ISO Peaker Contract
GTs								
CORONADO (North Island 1)	12.5		18.0		Cabrillo II	Yes	No	No
CORONADO (North Island 2)	12.5		18.0		Cabrillo II	Yes	No	No
DIVISNGT	12.5		14.0		Cabrillo II	Yes	No	No
ELCAJNGT	12.5		15.0		Cabrillo II	Yes	No	No
ENCINAGT	12.5		15.0		Cabrillo II	Yes	No	No
KEARN2AB (Kearney GT2)	12.5		15.0		Cabrillo II	Yes	No	No
KEARN2AB (Kearney GT2)	12.5		15.0		Cabrillo II	Yes	No	No
KEARN2CD (Kearney GT2)	12.5		15.0		Cabrillo II	Yes	No	No
KEARN2CD (Kearney GT2)	12.5		15.0		Cabrillo II	Yes	No	No
KEARN3AB (Kearney GT3)	12.5		15.0		Cabrillo II	Yes	No	No
KEARN3AB (Kearney GT3)	12.5		15.0		Cabrillo II	Yes	No	No
KEARN3CD (Kearney GT3)	12.5		15.0		Cabrillo II	Yes	No	No
KEARN3CD (Kearney GT3)	12.5		15.0		Cabrillo II	Yes	No	No
KEARNGT1	12.5		16.0		Cabrillo II	Yes	No	No
MIRAMRGT (Miramar GT1)	12.5		18.0		Cabrillo II	Yes	No	No
MIRAMRGT (Miramar GT1)	12.5		18.0		Cabrillo II	Yes	No	No
NAVSTGT (Naval station 1)	12.5		22.0		Cabrillo II	Yes	No	No
OLDTWNGT Naval Training Center)	12.5		15.0		Cabrillo II	Yes	No	No
SOUTHBGT	12.5		15.0		Duke	Yes	No	No
		GT Total	**304.0**	**MW**				
Steam Units	**--KV--**		**-PMAX-**					
ENCINA 1	14.4		99.0		Cabrillo 1	Yes	No	No
ENCINA 2	14.4		103.0		Cabrillo 1	Yes	No	No
ENCINA 3	14.4		109.0		Cabrillo 1	Yes	No	No
ENCINA 4	22		299.0		Cabrillo 1	Yes	No	No
ENCINA 5	24		329.0		Cabrillo 1	Yes	No	No
SOUTHBY1	15		145.0		Duke	Yes	No	No
SOUTHBY2	15		149.0		Duke	Yes	No	No
SOUTHBY3	20		174.0		Duke	Yes	No	No
SOUTHBY4	20		221.0		Duke	Yes	No	No
		Steam Total	**1628.0**	**MW**				
QF/CoGen	**--KV--**		**-PMAX-**					
DIVISION	69		47.0		AEI	No	No	No
GOALLINE	69		50.0		PurEnergy	No	No	No
NOISLMTR (North Island)	69		33.0		AEI	Yes	No	No
POINTLMA (NTC/MCRD)	69		22.0		AEI	Yes	No	No
Misc Customer Owned Capacity(4)			23.0		Misc	No	No	No
		QF Total	**175.0**	**MW**				
Peakers For 2001	**--KV--**		**-PMAX-**					
BORDER/Larkspur	69		49.0		Coral	No	Yes(1)	No
BORDER/Larkspur	69		49.0		Coral	No	Yes(1)	No
BORDER/CalPeak(3)	69		49.0		CalPeak	No	Yes	No
ESCNDIDO/CalPeak(3)	69		49.0		CalPeak	No	Yes	No
Ramco Escondido	69		49.0		Ramco	No	No	Yes(2)
Ramco Chula Vista	13.8		42.0		Ramco	No	No	Yes(2)
		Peaker Total	**287.0**	**MW**				
		Grand Total	**2394.0**					

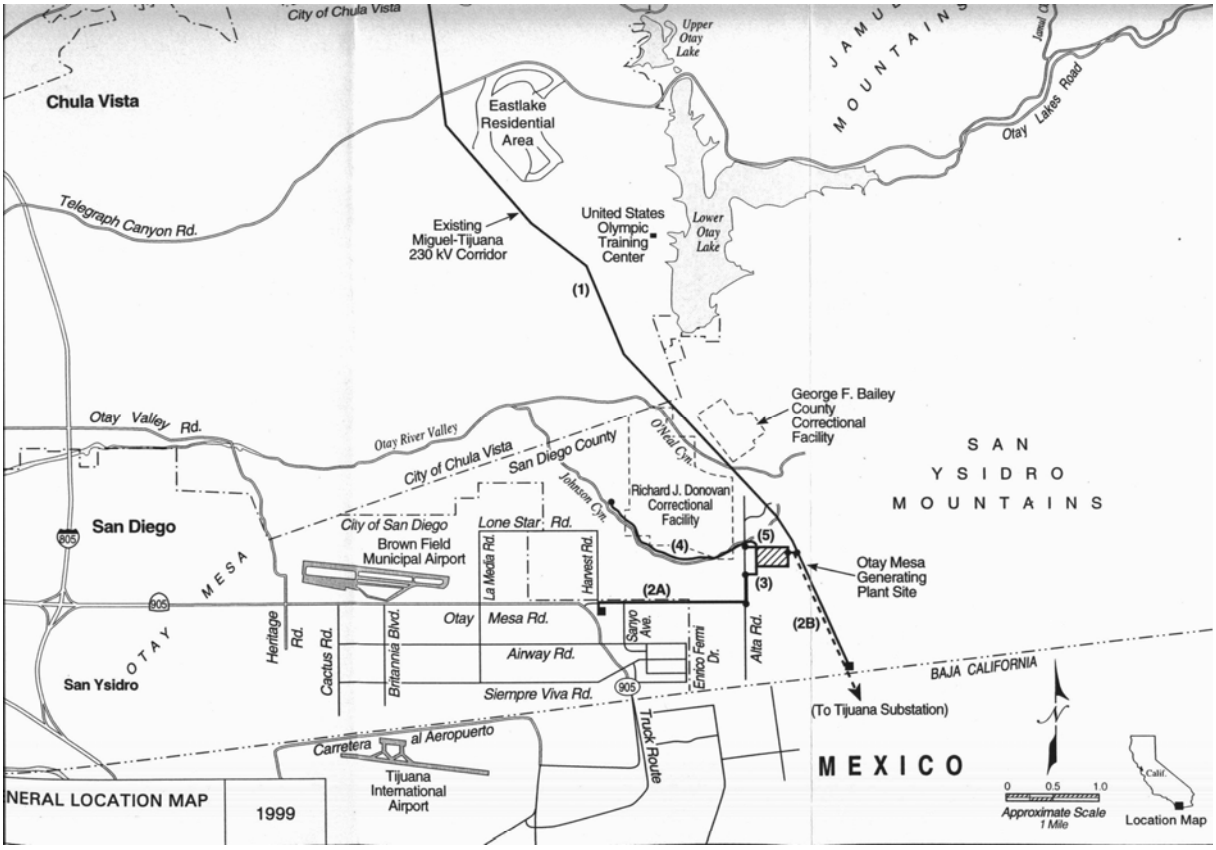
Details of the Proposed Otay Mesa Power Plant.

The plant will require a 0.1-mile connection to San Diego Gas & Electric's (SDG&E) existing 230-kV Miguel–Tijuana transmission line that passes near the eastern boundary of the Otay Mesa site. The project will use dry-cooling technology, which is discussed later in this chapter. The process water for steam generation and potable water for domestic needs will be supplied by reclaimed water from the Otay Water District via a 0.2-mile pipeline connection. Wastewater from the plant will be transported to San Diego County's sewer system from the plant, via a new 2-mile pipeline that will connect to an existing line in Johnson Canyon.

Otay Mesa will use dry cooling. Some of the main features of dry cooling are:

- It reduces water consumption by 95 percent
- Smokestacks have no plumes
- Reduced permitting process
- The key disadvantages of dry cooling is the systems are the noise, large land requirements and cost, which can be as much as 15-percent higher, noted an article in the San Diego Union-Tribute.

Figure F-1. Map



Proposed Sempra Energy Palomar Energy Project (Source: CEC)

On November 28, 2001, Palomar Energy LLC (Palomar) filed an Application for Certification (AFC), for its proposed Palomar Energy Project (PEP) with the California Energy Commission seeking approval to construct and operate a 500-megawatt (MW) natural gas-fired, combined-cycle electric generating facility. The plant will be owned and operated by Palomar, a wholly owned subsidiary of Sempra Energy Resources. The proposed project would be located on a vacant 20-acre site within a proposed 186-acre industrial park in the City of Escondido, California. The industrial park project is known as the Escondido Research and Technology Center (ERTC). The ERTC project and a draft Specific Plan for the industrial park project area are currently undergoing a California Environmental Quality Act (CEQA) review, with the City of Escondido as Lead Agency. Schedule. The project is proposed to be operational in the summer of 2004. Facility Operation. The proposed power plant will consist of two General Electric 7FA natural-gas fired combustion turbine-generators (CTGs) equipped with dry low nitrogen oxide (NOx) combustors and evaporative inlet air coolers, as well as two heat recovery steam generators (HRSG), a steam turbine generator and associated auxiliary systems and equipment. In addition to the dry low NOx combustors, the power plant will also be equipped with selective catalytic reduction (SCR) systems for NOx control and oxidation catalyst systems for carbon monoxide (CO) and volatile organic compounds (VOCs) control. NOx emissions will be controlled to 2.0 parts-per-million volume dry basis (ppmvd) at 15-percent oxygen by the SCR systems. CO emissions will be controlled to 4.0 ppmvd at 15-percent oxygen using an oxidation catalyst system. The project's electric generation will be connected to a new 230-kV switchyard adjacent to the facility. From the switchyard, generated power will be transmitted to an existing San Diego Gas & Electric (SDG&E) 230-kV transmission line located adjacent to the project site. Electricity Market. Electricity generated from this facility may be sold to the California Department of Water Resources (DWR) under an existing contract with Sempra Energy Resources. The City of Escondido has also expressed interest in purchasing electricity from the project. The applicant has indicated that all electricity sales will be in accordance with the appropriate market rules.

Fuel. Natural gas will be the only fuel utilized by the two new CTGs. Natural gas will be supplied to the CTGs via an existing SDG&E natural gas pipeline located immediately adjacent to the project site.

Water. The Palomar Energy Project will utilize approximately 3.6 million gallons per day of reclaimed water provided by the City of Escondido's Hale Avenue Resource Recovery Facility (HARRF). Reclaimed water will be conveyed to the site by a new 1.1-mile, 16-inch, pipeline connecting to an existing City of Escondido reclaimed water main on Harmony Grove Road. The project's cooling tower will evaporate nearly 75 percent of the reclaimed water.

Assumptions for the Wholesale Electric Price Forecast

SAIC prepared a forecast of wholesale electric prices for San Diego County and adjacent areas. Our approach in preparing this forecast was to simulate the behavior of this market through the use of a general equilibrium model. General equilibrium models produce projections of energy prices through the dispatch of specific generating units or groups of generating units while producing an optimized expansion plan through time. The model SAIC choose to perform this analysis was the Market Power model distributed by New Energy Associates of Atlanta, Georgia.

General Assumptions

The following general assumptions were employed in this analysis:

- SAIC prepared these projections in nominal (current year) dollars;
- The area modeled in these simulations was the WSCC;
- SAIC assumed that a competitive wholesale electric market would develop in the California and the WSCC.

Inflation

Inflation forecasts used in this forecast were adopted from the California Energy Commission (CEC) Electricity Outlook Report. This report provided inflation estimates until 2012. For periods after 2012 estimates for the last year were extrapolated until the end of the study period.

Market Areas

SAIC performed this analysis based upon market areas. The primary market areas in the WSCC are as follows:

- The Rocky Mountain region;
- The Pacific Northwest;
- Arizona-New Mexico;
- California / Southern Nevada / Baja California.

The California/ Southern Nevada / Baja California was further differentiated to isolate San Diego County, Southern California and Baja California.

Existing Generation Stock

The Market Power model contains a database of all electric generating units in the various reliability councils. New Energy receives this data from RDI. These databases contain the following information for each unit:

1. Technology
2. In-service date
3. Maximum capacity
4. Heat rate
5. De-ration factors
6. Fuel type
7. Forced outage rate
8. Scheduled outage requirements

Fuel Prices

The primary fuel prices that establish the marginal cost (dispatch price) are natural gas, residual fuel oil and coal. Nuclear fuel and distillate oil are also used in the region but rarely if ever establish dispatch prices. Furthermore, hydroelectric units are also sub-marginal. Fuel prices were established as follows:

Natural Gas

Natural gas prices at Henry Hub were adopted from the CEC. Table F-1 details these values.

Table F-2. Natural Gas Prices Delivered to Electric Generating Units ($/MCF)

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
SoCal Gas/ San Diego	2.94	3.00	3.06	3.16	3.25	3.33	3.41	3.48	3.56	3.63	3.70

Source: CEC 2002–2012 Electricity Outlook Report, Appendix A-2

An alternative natural gas price scenario was based upon projections of natural gas prices produced by the US DOE-EIA. These prices were derived from projections in AEO 2002, the EIA's annual energy forecast.

Residual Oil

Residual oil forecasts produced by Resource Data International were used in this analysis. Plants in Southern California were limited to a maximum residual oil burn of 2 percent per year.

Nuclear Fuel

Nuclear fuel was escalated at the rate of inflation.

Coal

Coal price forecasted were supplied by Resource Data International. Existing major coal units were generally forecasted on a station basis for larger units. Smaller and generic units were forecasted based upon regional coal price estimates.

Load Growth

Load growth projections for non-California entities were taken from Form 714 filing made with the Federal Energy regulatory Commission (FERC). These filings were:

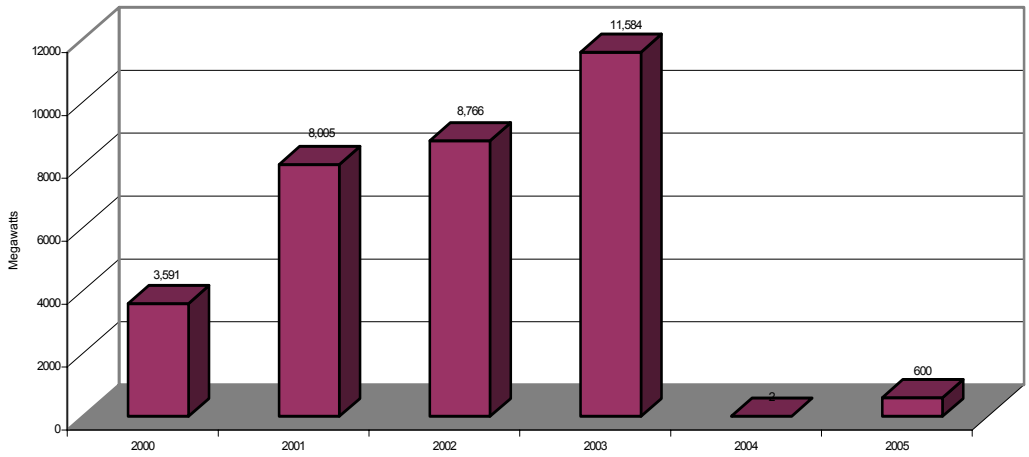
California load forecasts, with the exception of San Diego Gas and Electric, were taken from the CEC 2002–2012 Electricity Report. The specific details of the SDG&E forecast is discussed elsewhere in this report.

New Generation

New generation was introduced in two manners in this analysis: (1) Specifically identified units and prototype generating units introduced by the model in the creation of the expansion plan.

Specifically identified projects and prototype projects introduced by the model. Provided below in Figure F-2 is a chart summarizing the number of megawatts of new projects that were specifically identified and included in our modeling.

Figure F-2. New Projects in the WSCC



The number of new megawatts of generating units specifically identified was performed through extracts from the RDI NewGen database. After these extracts were performed project personnel then analyzed results to exclude projects that we felt were unlikely to occur.

The Market Power model creates this expansion plan by choosing from the fleet of potential new units hat may be constructed during a specific period (prototype technologies) and determine which technologies need to be added in order to create the most economic expansion plan. Therefore, after specifically identified units are added to the generation mix an algorithm in the model as additional

units until such time as an economic expansion plant has been achieved. The characteristics of the prototype technologies are discussed below.

The prototype technologies periodically decreased the specified heat rate in order to account for changes in technology. Table F-3 specifies these heat rates for combined-cycle and simple-cycle combustion turbines:

Table F-3. Projected Full Load Heat Rates (Btu/kWh) by Technology Projected to Be Achieved in the Period 2002–2030

Years	Simple-Cycle Combustion Turbine	Combined-Cycle Combustion Turbine
2002–2008	10,487	6,566
2009–2013	10,427	6,435
2014–2018	10,070	6,306
2019–2030	9,871	6,180

Prototype technologies for California and non-California applications had different installed costs and emissions outputs. The installed cost for California units are provided in Table F-4.

Table F-4. Installed Cost of Various Generation Technologies – 2002 Dollars per Kilowatt

Technology	California Application	Non-California Application
Simple-Cycle Combustion Turbine	$550	$385
Combined-Cycle Combustion Turbine	$850	$650
Coal-fired Steam Plant	Not Applicable	$1,600

The installed cost reflects the overall higher costs associated with siting a unit in California, attaining stricter NOX emission standards and property costs. Coal-fired steam units were assumed to only be feasible in non-environmentally sensitive regions and thus excluded California.

All prototype generation was assumed to require a 14.5 percent IRR for the base case. An alternative high cost of capital case was run. In this scenario generating units constructed in California were assumed to require an IRR of 16.5 percent due to regulatory risk.

Unit Retirements

Unit retirements for steam units were assumed to occur when a unit reaches 50 years of age. Simple cycle combustion turbines were assumed to have an economic life of 35 years. For the nuclear plants in the region SAIC assumed these units would receive 20-year life extensions after the initial license life of 40 years expired. Hydroelectric units were assumed to not retire.

Emissions Allowances

California has very serious problems with the creation of ozone. For this reason ozone allowances in California are significantly more expensive than in the other major of the non-attainment regions in the United States. SAIC assumed that NOx allowances for California were priced at the equivalent of $10,740 per ton-year in 2002. After that time period we assumed they increased with inflation.

The balance of the WSCC priced NOX allowances at $1,600 per ton. SOX allowances were priced at $303 per ton escalating at inflation.

Forced Outage Rates

Forced outage rates were adopted based upon NERC GADS data. Forced outage rates were assigned based upon generating unit category.

Scheduled Outage Hours

Scheduled outage hours for each generating unit category used NERC GADS data.

Transmission Interconnections

Transmission interconnections were modeled using a transportation methodology, i.e., the capacity of transmission interconnections between regions was assumed not to vary within a given period. The transmission capabilities for the majority of the WSCC were adopted from various WSCC publications where non-simultaneous transmission were published. Detailed information about the SDG&E area was received from the Company and various CPUC filings.

Appendix G: COMPASS Modeling

SAIC's approach to screening, designing and evaluating demand side programs including energy efficiency and demand response was the following:

- Reviewed sector sales and selected loads
- Identified applicable programs
- Gathered data on technology impacts, market size, saturation of efficiency measures, energy and demand savings, implementation costs
- Designed programs
- Entered data into the COMPASS[2] model
- Analyzed programs using COMPASS
- Summarized results.

The screening model used is Silicon Energy's COMPASS model. SAIC licensed the model for use in this project.

Key features of the model are the following:

- COMPASS is designed for demand side market planning
- Information is organized in relational databases
- Detailed information stored in specific databases
- Markets and growth, technology characteristics, rates and other key data for the 30-year period
- Output allows evaluation of demand-side management programs from different perspectives
- Based on California Standard Practice Tests

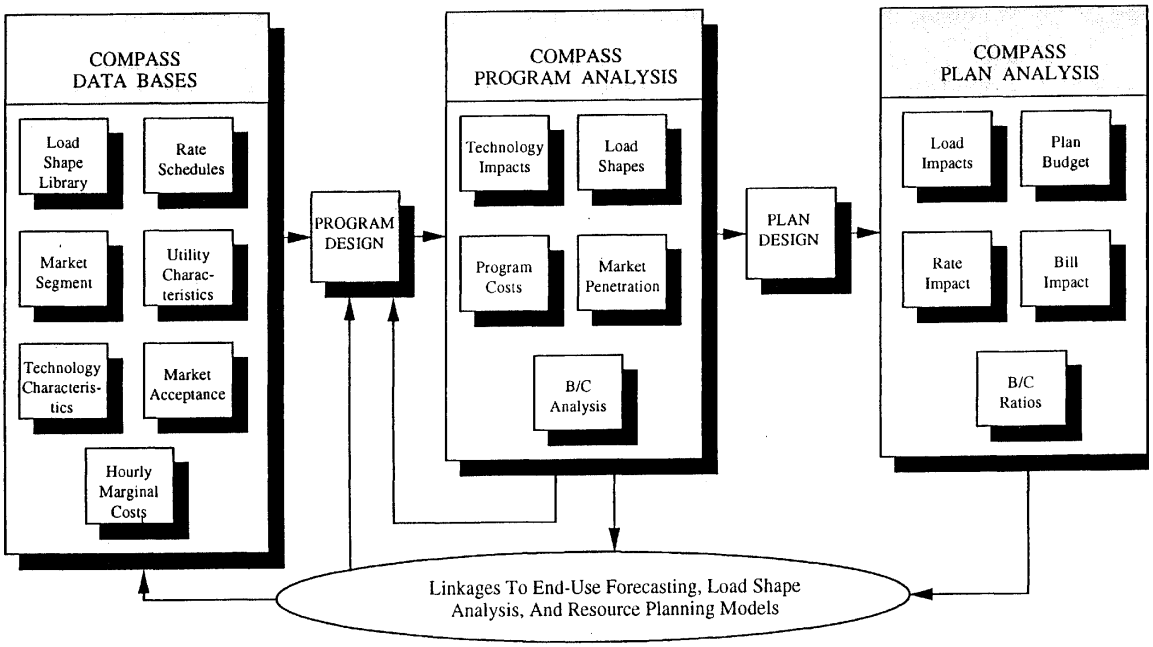
Other Compass features:

- All data and analysis in a single software package
- Integrates complex multi-factor analysis procedures
- Relational database manages all relevant data
- Full feature rate model
- Explicit modeling of market penetration and diffusion
- Market adoption calculated with and without program (accounts for free-riders)
- Benefit/cost methodology consistent with standard practice methodology
- Scenario analysis capability

See Figure G-1 regarding the general structure of the model.

[2] Stands for the "Comprehensive Market Planning and Analysis System."

Figure G-1. Overview of COMPASS



The following market data by segment was used in the analysis of DSM potential (Table G-1).

Table G-1. Market Data by Segment

Sector	RESID	RESID	COMM	COMM	COMM	INDUS	INDUS	INDUS
Segment	Single Family	Multi Family	Comm Buildings	Comm MWH Sales	Comm Flr Space	Indust Lighting	Indust Motors	Ind MWH Sales
Description	Number of Homes	Number of Homes	Total Number of Commercial Buildings	Total MWH Sales to Commercial Buildings	Total SF of Commercial Buildings	MWH Sales For All Industrial Lighting Programs	MWH Sales For All Industrial Motors Programs	MWH Sales For All Sales Based Industrial Programs
Units	HOMES	HOMES	Buildings	MWH Sales	1000 sf	MWH Sales	MWH Sales	MWH Sales
Year 2002 Estimate	641.11	408.07	86.93	661.10	503.47	249.66	691.86	1979.00
Growth Rate, %/year	1.3	1.8	2.30	2.30	2.30	3.30	3.30	3.30
Demolition Rate, %/year	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Discount Rate, %	15.00	15.00	12.50	12.50	12.50	12.50	12.50	12.50

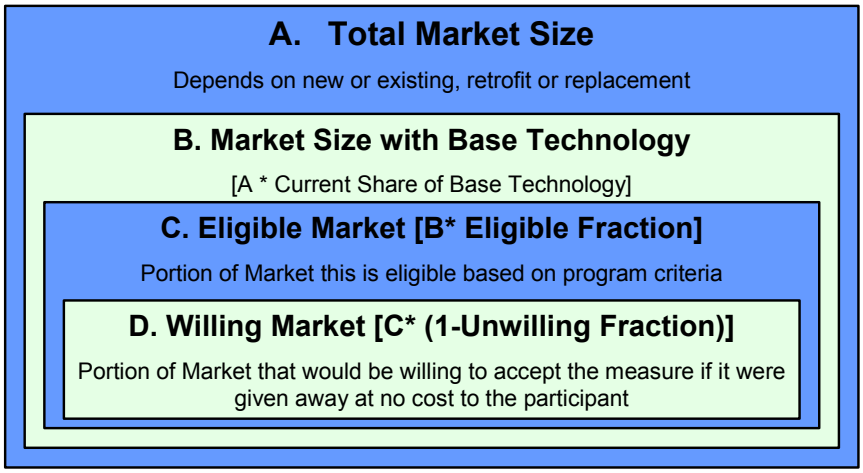
In applying the model the following assumptions were used:

- SDG&E Rates were used as inputs in the COMPASS Rates Database
  - Residential
    - Domestic Rate Schedule DR
    - Natural Gas Rate GR
  - Commercial
    - General Service Time Metered, Schedule AL-TOU
    - Commodity Rate EECC (DWR Decision)
    - Gas for Core Commercial Customers Rate GN-3
    - Escalation Rate: 2.09% per year
    - COMPASS uses marginal rate (tail block) to compute bills and savings

COMPASS technology data file consists of:

- Technology characteristics feature in COMPASS was used to input energy consumption:
  - For Base and Associated DSM Technology
  - For New and Existing Vintage
- Data entered included:
  - Technology cost and change in cost over time
  - Current market share of the base/DSM technology
  - Average customer energy/demand by season and time period
  - Coincidence factor to determine impact during system peak
  - Diversity factor to estimate impact on customer bill
- The COMPASS mass-market acceptance file consists of:
  - COMPASS uses market acceptance scenarios to estimate penetration of the DSM technology
  - Market acceptance files have different inputs for Program and No-Program case
  - To estimate technical potential, market potential for program case is set to 100% and for no-program case is set to 0% (i.e. program is credited with 100% of the savings)
  - Market acceptance scenarios in SDREO analysis included Payback Acceptance Curves or Direct Entry based on the technology.
  - COMPASS default payback acceptance curves were used
  - Payback acceptance curves were different for Residential, Commercial, and Industrial sectors

Figure G-2. Calculating Market Size in COMPASS



- Willing Market is a small fraction of the total market
- Final Adoption can be much smaller than willing market

Compass Utility Characteristics File

Key assumptions used were:

- Loss Factors (10% in Summer, 9% in Winter)
- Discount Rates for Utility (12%), TRC (12%), Societal (9.5%)
- Inflation Rate (2.09%)

- Electric Avoided Capacity and Energy Costs by season and period (see next page)
- Electric Avoided T&D Costs ($10/kW-year with 3% esc)
- Gas Avoided Costs
- Sales, # of customers, Revenue Requirements

Table G-2. Electric: Avoided Costs for Energy and Capacity (Base Case)

	Capacity, $/kW/year		Energy, $/MWH			
	Summer	Winter	Summer		Winter	
			On	Off	On	Off
2002	99.14	-	34.86	31.90	36.90	35.04
2003	99.28	-	30.71	28.88	33.48	31.63
2004	96.98	-	30.64	28.48	32.38	29.60
2005	90.43	-	32.20	31.00	34.75	33.12
2006	99.77	-	36.82	33.59	38.22	36.12
2007	99.94	-	36.64	34.16	38.59	36.29
2008	100.11	-	37.88	34.63	39.45	36.38
2009	100.29	-	40.33	36.50	42.02	38.53
2010	112.37	-	43.71	38.72	44.56	41.18
2011	115.79	-	48.56	40.86	48.01	43.74
2012	119.53	-	49.66	42.67	49.52	44.88
2013	123.39	-	54.33	44.52	52.15	46.76
2014	127.19	-	56.87	45.89	54.16	48.36
2015	131.16	-	61.02	47.81	56.92	50.14
2016	135.48	-	62.67	48.88	58.83	51.19
2017	140.13	-	65.08	50.29	61.72	52.88
2018	144.62	-	67.53	51.88	64.66	54.39
2019	149.18	-	69.45	53.37	67.11	55.83
2020	154.03	-	71.97	54.79	69.16	57.06
2021	159.04	-	73.61	56.25	71.49	58.61
2022	164.24	-	75.40	57.54	73.15	60.12
2023	169.61	-	77.70	59.09	75.58	61.79
2024	175.10	-	80.04	60.53	77.71	63.23
2025	180.77	-	82.32	62.02	80.81	65.25
2026	180.98	-	83.79	63.49	82.73	66.72
2027	180.87	-	85.48	64.87	84.27	68.44
2028	256.53	-	87.06	66.48	85.59	69.88
2029	263.86	-	90.78	68.72	90.73	72.09
2030	253.10	-	91.84	69.41	92.41	73.35

Table G-3. Utility Revenue Requirements

	Revenue , $ (1)	MWH Sold Year 2000 (1)	MWH Sold Year 2001	MWH Sold Year 2002	$/MWH (computed)	Growth
Residential	729,798,797	6,304,063	6,392,320	6,481,812	115.77	1.40%
Small C/I	746,793,366	6,125,149	6,266,027	6,410,146	121.92	2.30%
Large C/I	309,731,267	2,614,082	2,700,347	2,789,458	118.49	3.30%
Other	7,544,357	74,264	75,749	77,264	101.59	2.00%

(1) Source: FERC Form 1, Year 2000, Page 300-301

The Programs

- Residential
  - Advanced metering and control
  - Photovoltaics
  - Retrofit program
  - Condition of Sale
  - Title 24 Plus

- Commercial/Industrial
  - Demand flexibility
  - High efficiency motors
  - High efficiency lighting
  - Photovoltaics
  - Retrofit program
  - E2Pro: Energy and Environment Program

Program Design in Compass

- Program design in COMPASS combines data from all databases with program design elements to estimate program participation and effectiveness
- Program description data includes:
  - New or existing customer
  - Utility characteristics data
  - Retrofit or replacement program
  - Existing facility or new facility
  - Persistence, start, years program in effect and duration
  - Assignment of customer rates, technology options, and market acceptance ramp up rate and technology diffusion
  - Eligible customer percent, unwilling percent and no program cases
  - Incentive type and amount
  - Program costs – one time fixed, annual fixed, annual variable
  - Repurchase rate
  - Drop out rate.

Table G-4. Program Costs

Program File	Program Name	Program Costs				High Case Incentive Payments
		2002 Costs, $			Future	
		One-Time Develpmt	Annual Fixed Cost	Variable Per Unit	Escalation Rate	
R-AM	Advanced Metering, Pricing and Control	33,064	43,264	100	2.09%	50% of Cap Cost plus $240 bill credit
R-RE-PV	Photovoltaics	36,564	69,263	100	2.09%	Direct Entry, $6000 in 1st yr
R-RT-XX	Residential Retrofit	43,520	87,606	-	2.09%	-
R-RT-LC	Lighting – CFL					50% of cap cost
R-RT-CF	Space Conditioning – Wholehouse Fans					50% of cap cost
R-RT-CT	Space Conditioning – Programmable Tstat					50% of cap cost
R-RT-AI	Envelope – Attic Insulation					50% of cap cost
R-RT-WP	Envelope – Window Pane Glazing					50% of cap cost
R-RT-WG	Water Heating Efficiency Gas					50% of cap cost
R-RT-WE	Water Heating Efficiency Electric					50% of cap cost
R-RT-IG	Wtr Htr Insulation and Flow Control - Gas					50% of cap cost
R-RT-IE	Wtr Htr Insulation and Flow Control - Elec					50% of cap cost
R-RT-PP	Pool Pumps					50% of cap cost
R-CS	Condition of Sale HERS Rating	43,334	98,933	100	2.09%	None -- Regulatory
R-24	Title 24 Plus House	41,830	37,133	100	2.09%	50% of cap cost
C-DR	Flexible, Market Driven Demand Response	16,895	24,367	10	2.09%	$100/kW
C-RE-PV	Photovoltaics	36,000	69,000	3,000	2.09%	$6000/kW 1st year Direct Entry
C-RT-XX	Commercial Retrofit	49,239	164,428	200	2.09%	
C-RT-LC	Lighting – CFL					$200/kW saved
C-RT-L8	Lighting – T8					$200/kW saved
C-RT-L5	Lighting – T5					$200/kW saved
C-RT-LT	Lighting – Control Timer					$200/kW saved
C-RT-CH	Space Conditioning – High Efficiency					$100/kW saved
C-RT-CS	Cool Storage					$200/kW saved
C-RT-RC	Envelope – Cool Roofs					50% of cap cost
C-DG	Distributed Generation Promotion	36,403	74,500	10	2.09%	$500/kW saved
C-E2	E2 – Clean Energy and Environment Program	40,390	48,219	1	2.09%	$125/kW saved
I-DR	Flexible, Market Driven Demand Response	11,520	21,240	1	2.09%	$100/kW
I-MO-EE	High Efficiency Motor and Drive New &	29,475	42,940	1	2.09%	$100/kW saved
I-LI-HE	High Efficiency Lighting	24,307	36,539	1	2.09%	$100/kW saved
I-E2	E2 – Clean Energy and Environment Program	18,611	21,912	1	2.09%	$100/kW saved

Table G-5. Program Eligibility and Penetration

Program File	Program Name	Market Acceptance	Program Type	Program Eligibility and Willingness		
				Eligible Percent	Percent - Program	Percent - No Program
R-AM	Advanced Metering, Pricing and Control	Direct Entry	Replacement	100%	0%	0%
R-RE-PV	Photovoltaics	Direct Entry	Replacement	85%	20%	20%
R-RT-XX	Residential Retrofit			85%	20%	20%
R-RT-LC	Lighting – CFL	Res PB Accept	Replacement	85%	20%	20%
R-RT-CF	Space Conditioning – Wholehouse Fans	Res PB Accept	Replacement	85%	20%	20%
R-RT-CT	Space Conditioning – Programmable Tstat	Res PB Accept	Replacement	85%	20%	20%
R-RT-AI	Envelope – Attic Insulation	Res PB Accept	Replacement	85%	20%	20%
R-RT-WP	Envelope – Window Pane Glazing	Res PB Accept	Replacement	85%	20%	20%
R-RT-WG	Water Heating Efficiency Gas	Res PB Accept	Replacement	85%	20%	20%
R-RT-WE	Water Heating Efficiency Electric	Res PB Accept	Replacement	85%	20%	20%
R-RT-IG	Wtr Htr Insulation and Flow Control - Gas	Res PB Accept	Retrofit	85%	20%	80%
R-RT-IE	Wtr Htr Insulation and Flow Control - Elec	Res PB Accept	Retrofit	85%	20%	20%
R-RT-PP	Pool Pumps	Res PB Accept	Retrofit	85%	20%	20%
R-CS	Condition of Sale HERS Rating	Direct Entry	Replacement	100%	0%	100%
R-24	Title 24 Plus House	Res PB Accept	Retrofit	50%	20%	80%
C-DR	Flexible, Market Driven Demand Response	Com PB Accept	Retrofit	20%	20%	100%
C-RE-PV	Photovoltaics	Com PB Accept	Replacement	10%	20%	20%
C-RT-XX	Commercial Retrofit	Com PB Accept		85%	20%	20%
C-RT-LC	Lighting – CFL	Com PB Accept	Replacement	50%	20%	80%
C-RT-L8	Lighting – T8	Com PB Accept	Replacement	33%	20%	80%
C-RT-L5	Lighting – T5	Com PB Accept	Replacement	67%	20%	80%
C-RT-LT	Lighting – Control Timer	Com PB Accept	Replacement	80%	20%	80%
C-RT-CH	Space Conditioning – High Efficiency	Com PB Accept	Replacement	80%	20%	20%
C-RT-CS	Cool Storage	Com PB Accept	Replacement	80%	20%	20%
C-RT-RC	Envelope – Cool Roofs	Com PB Accept	Replacement	80%	20%	80%
C-DG	Distributed Generation Promotion	Com PB Accept	Retrofit	20%	20%	100%
C-E2	E2 – Clean Energy and Environment Program	Com E2Pro 20%	Retrofit	100%	1%	100%
I-DR	Flexible, Market Driven Demand Response	Ind PB Accept	Retrofit	20%	20%	100%
I-MO-EE	High Efficiency Motor and Drive New &	Ind PB Accept	Retrofit	80%	20%	80%
I-LI-HE	High Efficiency Lighting	Ind PB Accept	Retrofit	80%	20%	80%
I-E2	E2 – Clean Energy and Environment Program	Ind E2PRO: 20%	Retrofit	100%	0%	100%

Scenarios – Low, Medium, and High Cases

- Low, medium, and high DSM impact scenarios were developed
- Differences in scenarios are shown
- Use different marginal costs for each scenario
- Program incentives, costs and penetration rates varied.

Table G-6. Low, Medium, and High Case Scenarios

	LOW	MEDIUM	HIGH
Marginal Electric Costs	EIA Gas Price Scenario	Base Case Scenario	High Capacity Costs Scenario
Marginal Gas Costs	CEC Gas Price Forecast	CEC Gas Price Forecast	CEC Gas Price Forecast
Program Design			
Duration, years	30 years	30 years	30 years
Incentives	50% of High Case	75% of High Case	100% of High Case
Direct Entry Market Acceptance	50% of High Case	75% of High Case	100% of High Case
Program Costs	50% of High Case	75% of High Case	100% of High Case

Table G-7. Comparison of CHP Technologies

Factors	Diesel Engine	NG Engine	Steam Turbine	Gas Turbine	Micro-Turbine	Fuel Cells
Electric Efficiency (LHV)	30–50%	24–45%	30–42%	25–40% (Simple), 40–60% Combined	20–30%	40–70%
Footprint (Sq ft/kW	0.22	0.22–0.31	<0.1	0.02-0.61	0.15–1.5	0.6–4
Installed Cost (S/kW)	$800–1,500	$800–1,500	$800–1,000	$700–900	$500–1,300	>$3,000
O&M Cost ($/kWh)	0.005–0.008	0.007–0.015	0.004	0.002–0.008	0.002–0.01	0.003–0.015
Fuels	Diesel and Residual	NG, Biogas, Propane	All	NG, Biogas, Propane, Distillate	NG, Biogas, Propane, Distillate	Hydrogen, NG, and Propane
NOx Emissions (lb/MWh)	3–33	2.2–28	1.8	0.3–4	0.4–2.2	<0.02
CHP Output (BTU/kWh)	3,400	1,000–5,000	n/a	3,400–12,000	4,000–15,000	500–3,700
Usable Temperature For CHP (F)	180–900	300–500	n/a	500–1,100	400–650	140–700

Table G-8. Comparative Retail Economics by Type of Load and Unit (Cents/kWh)

Load	Unit Type	Competitive Retail Economics		
		Busbar	T&D	Total
Peaking	150 MW Simple Cycle	0.12	2.75	14.75
	DG (5 MW Gas Turbine)	0.125		0.125
Intermediate	225 MW Combined Cycle	0.06	0.01	0.07
	CHP (5 MW Combined Cycle)	0.06		
Base Load	225 MW Combined Cycle	0.04	0.01	0.05
	CHP (5 MW Combined Cycle)	0.04		